AUTOMOTIVE INDUSTRIES

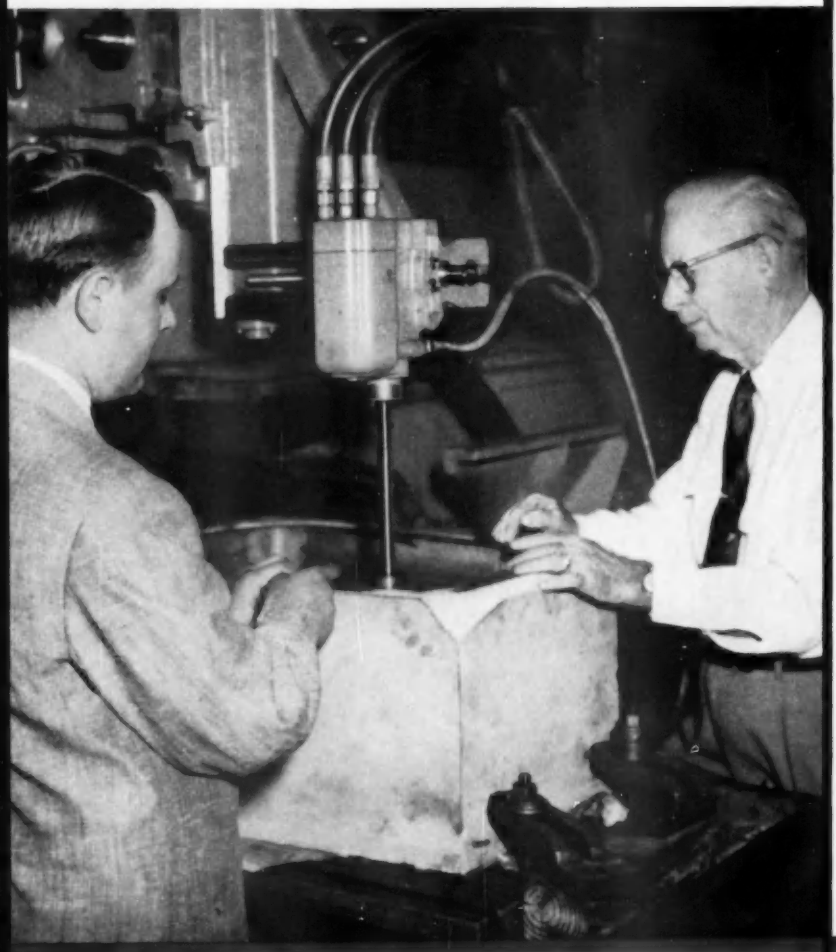
AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

APRIL 1, 1956

In This Issue

A CHILTON PUBLICATION

STANOIL *Industrial Oil tough performer in delicate operation*



A. T. Wallace (right), President of Wallace Tool and Die Company, and Standard Oil lubrication specialist, H. A. Peterson, check sensitivity of new Cincinnati Hydro-Tel Milling Machine which uses STANOIL as hydraulic medium. Howard Peterson has been providing technical service to customers since joining Standard Oil. He is a graduate of General Motors Institute. Howard's customers find this experience pays off *for them.*

Delicate operations with metal requiring almost a surgeon's skill are every day stuff to Wallace Tool and Die Company, Indianapolis. Recently, they purchased a Cincinnati Hydro-Tel Milling Machine for their highest precision work. They selected STANOIL Industrial Oil for the hydraulic medium. The reason for choosing STANOIL: they wanted a hydraulic fluid that could deliver high performance. They wanted a clean hydraulic system, free of deposits that might clog filters and interrupt operations. They wanted smooth operation without pump chatter and without foam. They got these with STANOIL.

How did Wallace Tool and Die come to choose STANOIL? The answer is not hard to find. They had used STANOIL for hydraulic systems throughout their plant for many years. It has given them the results they wanted so it was natural to pick STANOIL for their new Cincinnati machine.

With STANOIL the machine performs the delicate operation of contour tracing with only 3½ ounces of pressure needed to control the milling cutters. STANOIL gives them smooth, steady, uninterrupted performance.

STANOIL can serve you. In the Midwest a lubrication specialist at your nearby Standard Oil office will be glad to show you. Call him. Or contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

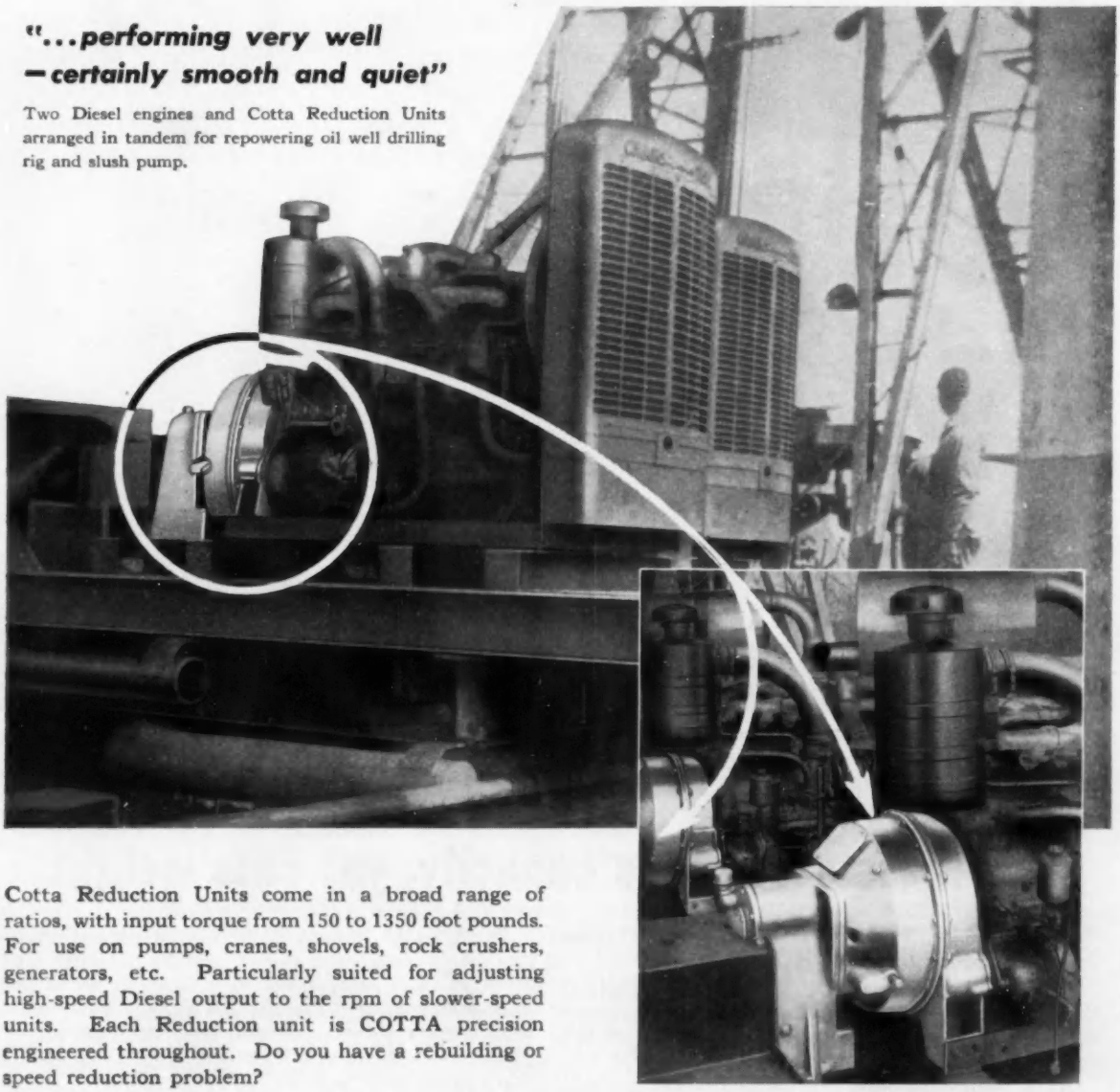
STANDARD

STANDARD OIL COMPANY (Indiana)

Repower Oil Well Drilling Rig with COTTA Reduction Units

"...performing very well —certainly smooth and quiet"

Two Diesel engines and Cotta Reduction Units arranged in tandem for repowering oil well drilling rig and slush pump.



Cotta Reduction Units come in a broad range of ratios, with input torque from 150 to 1350 foot pounds. For use on pumps, cranes, shovels, rock crushers, generators, etc. Particularly suited for adjusting high-speed Diesel output to the rpm of slower-speed units. Each Reduction unit is COTTA precision engineered throughout. Do you have a rebuilding or speed reduction problem?

THIS INFORMATION WILL HELP YOU

Diagrams, capacity tables, dimensions and complete specifications sent free on request. Just state your problem — COTTA engineers will help you select the right unit for best performance. May we work with you?

COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS

An Assurance of Dependable Service

COTTA
HEAVY-DUTY
REDUCTION UNITS
"Engineered-to-order"

Weight-saving frameless type van built of chromium-nickel stainless steel retains impressive beauty of silvery white metal despite wear and tear of travel. Deadweight reduction holds down operating and maintenance costs for Piedmont Mountain Freight Lines, of Charlotte and North Wilkesboro, North Carolina. Van produced by Black Diamond Trailer Co., Inc., Bristol, Va.

Stainless steel adds capacity, yet cuts weight

THE BODY of this 32-foot trailer is fabricated from Type 301 chromium-nickel stainless steel.

High mechanical properties of Type 301 helped the designer dispense with the frame, and reduce deadweight, yet increase over-all strength of the van.

As a result, the unit carries additional payload without a corresponding increase in axle loading. But this isn't the only advantage afforded by stainless steel.

The good forming and welding qualities of Type 301 permit swift, simplified fabrication, and make it easy to strengthen the sides with an integral-column ribbed construction offering exceptional resistance to side-bulging.

Particularly important to body-builders, stainless steels containing nickel provide not only high strength, but also ample toughness to withstand impact and battering, wear and abrasion. Resistant to corrosive attacks of rain, sleet, ice and atmosphere, these steels retain their silvery white beauty and remain easy to clean and keep clean.

Where you want long, money-saving performance, put stainless steel on the job. Leading steel companies produce austenitic chromium-nickel stainless steels in all commercial forms. We'll be glad to help you select exactly the right type of stainless for your specific needs. Send us details of your application for our suggestions.

INCO TRADE MARK **THE INTERNATIONAL NICKEL COMPANY, INC.** 67 Wall Street New York 5, N.Y.

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE — PUBLISHED SEMI-MONTHLY

APRIL 1, 1956 — VOL. 114, NO. 7

FEATURES

NEWS PREVIEWS

DEPARTMENTS

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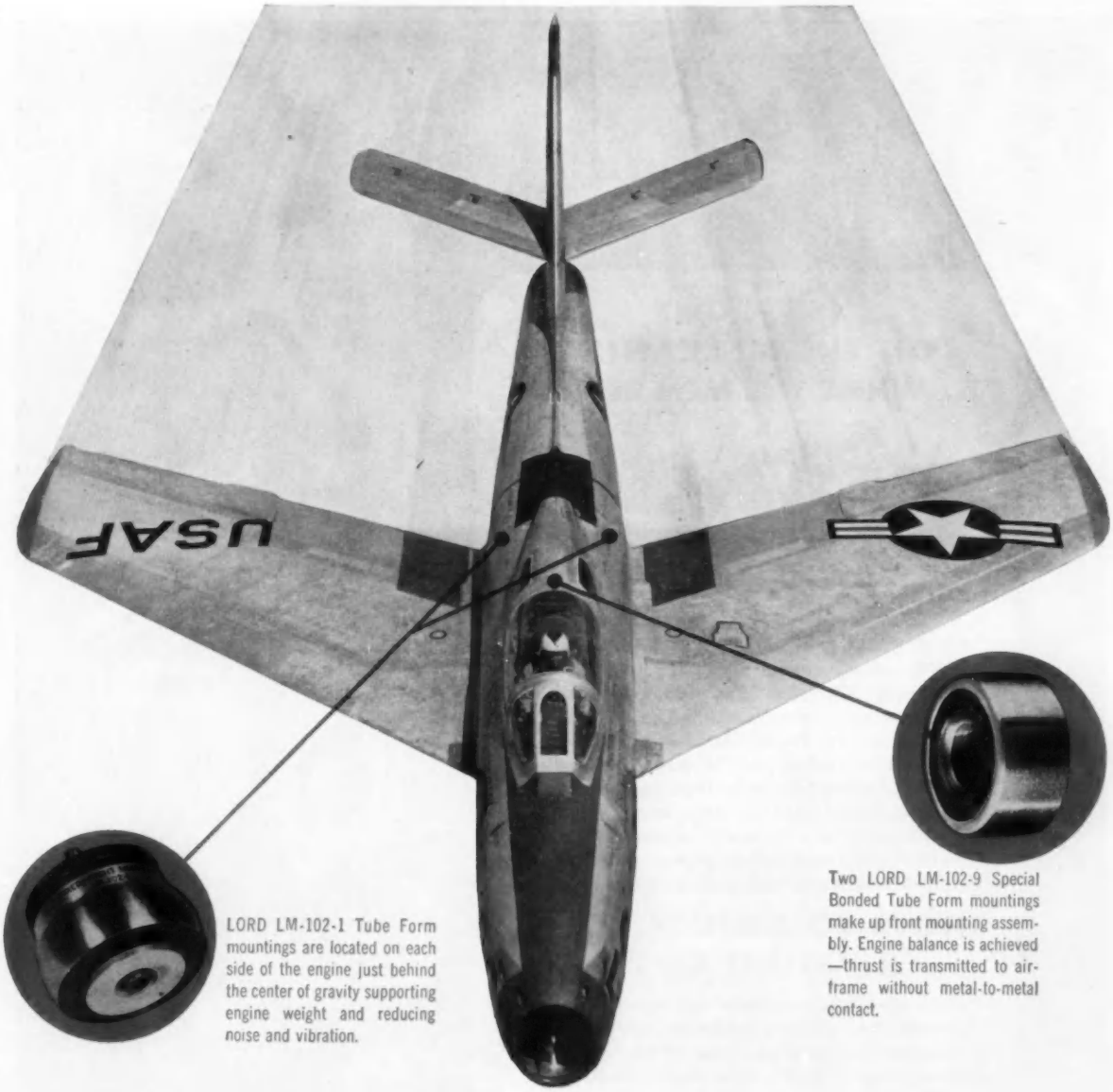

LORD LM-102-1 Tube Form mountings are located on each side of the engine just behind the center of gravity supporting engine weight and reducing noise and vibration.

Two LORD LM-102-9 Special Bonded Tube Form mountings make up front mounting assembly. Engine balance is achieved —thrust is transmitted to airframe without metal-to-metal contact.

F-84F: swept-wing, super-fast and **smooth**

A new standard in smooth, comfortable flight for jet aircraft has been established with the use of the first volume-produced resilient mountings for jet engines. LORD bonded rubber mountings are being used to isolate engine vibrations on the F-84F "Thunderstreak".

The entire 2500-pound weight and 7200-pound thrust of the power plant, a Curtiss-Wright J65 jet engine, is carried by the specially-designed LORD three-point suspension system. The LORD bonded rubber engine mountings were designed to withstand the extremely high operating temperatures.

On most of our modern aircraft—jet, turboprop and reciprocating —LORD mountings provide increased comfort and greater safety through the reduction of noise level and pilot fatigue from vibrations. For more information on LORD bonded rubber products, call your nearest LORD Field Engineer, or write the home office, Erie, Pa.

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LORD MANUFACTURING COMPANY • ERIE, PENNSYLVANIA

IT'S QUIET ON THE MEZZANINE ...WHILE THE MEN BELOW

rivet

...NOT 15 FEET AWAY!

This is a riveting line at the Irving Subway Grating Co., Long Island City, New York. *Yet you cannot hear the riveting!* Why? Because it's done with Hannifin "Hy-Power," the modern cold-squeeze riveting method.

Compact "Hy-Power" Portable Yoke Riveters quietly exert the force. The power is supplied by "Hy-Power" Hydraulic Pressure Generators (you see them right up there beside the man who is consulting the files) . . . compact, single units that include motor, pump, oil reservoir, control valves and high pressure intensifier.

HOW TO REDUCE YOUR RIVETING COSTS

Do it the "silent squeeze" way with Hannifin portable and stationary yoke riveters which are available in capacities from 7½ to 100 tons (more in multiple). It's a fast method. It's a method that assures complete uniformity of every rivet. It's a safe method; for while a touch of a button starts the ram, the stroke may be interrupted and the ram reversed at any point in the cycle, simply by releasing the control button.

See your Hannifin representative who will demonstrate why "Hy-Power" riveting and punching equipment has a place in your production picture. Hannifin Corporation, 1101 S. Kilbourn Ave., Chicago 24, Illinois.

WRITE FOR BULLETIN 150

The complete story of Hannifin "Hy-Power" Hydraulics. Your copy sent on request.

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Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves

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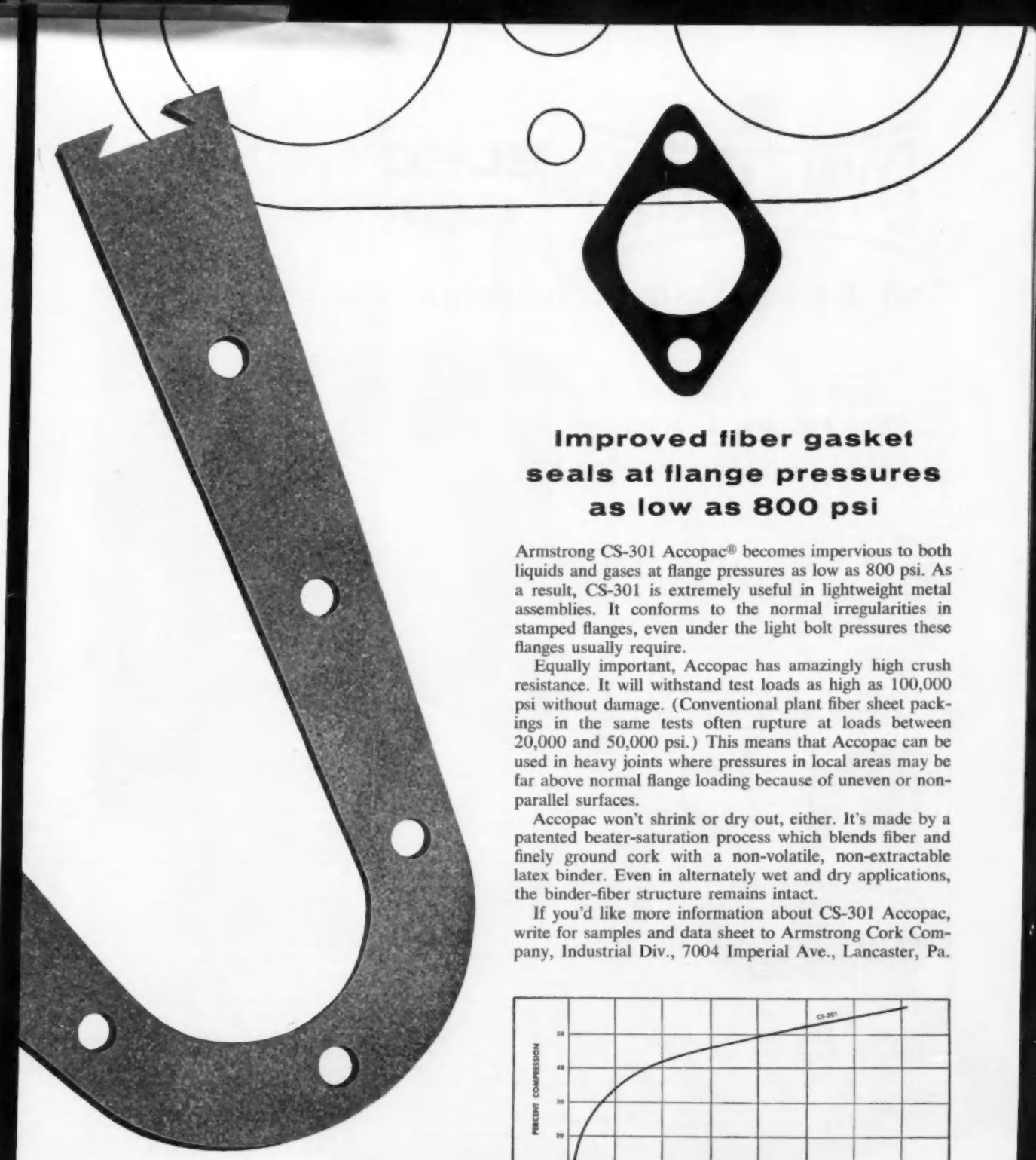


Improved fiber gasket seals at flange pressures as low as 800 psi

Armstrong CS-301 Accopac® becomes impervious to both liquids and gases at flange pressures as low as 800 psi. As a result, CS-301 is extremely useful in lightweight metal assemblies. It conforms to the normal irregularities in stamped flanges, even under the light bolt pressures these flanges usually require.

Equally important, Accopac has amazingly high crush resistance. It will withstand test loads as high as 100,000 psi without damage. (Conventional plant fiber sheet packings in the same tests often rupture at loads between 20,000 and 50,000 psi.) This means that Accopac can be used in heavy joints where pressures in local areas may be far above normal flange loading because of uneven or non-parallel surfaces.

Accopac won't shrink or dry out, either. It's made by a patented beater-saturation process which blends fiber and finely ground cork with a non-volatile, non-extractable latex binder. Even in alternately wet and dry applications, the binder-fiber structure remains intact.

If you'd like more information about CS-301 Accopac, write for samples and data sheet to Armstrong Cork Company, Industrial Div., 7004 Imperial Ave., Lancaster, Pa.

HIGH COMPRESSIBILITY of Accopac CS-301 is shown by load-compression curve. With light metal flanges, this compressibility allows gaskets to conform to surface irregularities and seal without distorting flange.

Armstrong ACCOPAC

. . . used wherever performance counts

EATON

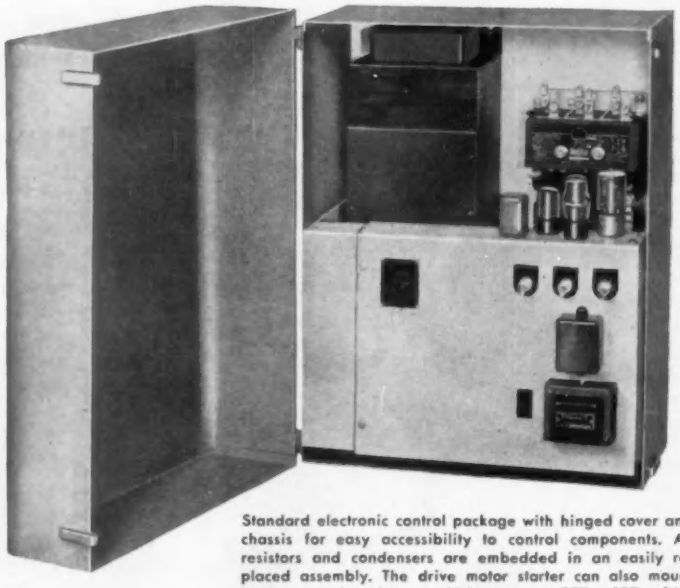
DYNAMATIC® ELECTRONIC CONTROLS

Can Solve Your Adjustable Speed Problems

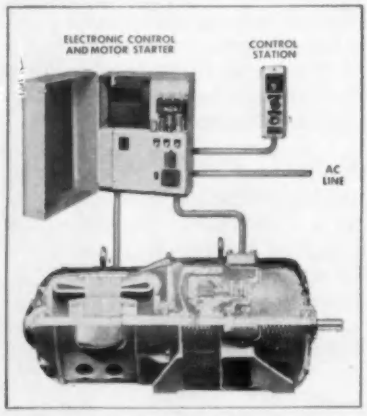
Dynamatic electronic controls with their simplicity, low maintenance, easy accessibility, and small space requirements, when used with Dynamatic Eddy-Current Drives, provide the solution to most adjustable speed drive problems.

The excitation required by Dynamatic eddy-current equipment is of very small magnitude compared to the drive capacity. For example, a 440 watt control is capable of controlling the torque or speed output of a 400 HP drive. Control and excitation power is taken directly from AC lines without the need of cumbersome and complicated convertors, with their installation, ventilation, and maintenance problems.

Since the control elements have a very high amplification factor, even the largest couplings may be easily and conveniently controlled with small adjusting potentiometers.



Standard electronic control package with hinged cover and chassis for easy accessibility to control components. All resistors and condensers are embedded in an easily replaced assembly. The drive motor starter can also mount in the control enclosure, which measures 25" x 19" x 14".



The small illustration shows the minimum of typical components necessary to obtain adjustable speed with Dynamatic eddy-current equipment. Speed regulation requirements on the order of 1/10 of 1 per cent of drive top speed are easily and economically accomplished with suitable control modifications. With low powered reliable electronic components, requirements to suit almost all drive problems are easily met without appreciably increasing the cost or size of the control components.

The following outline of operation will indicate the many advantages of this Dynamatic control equipment.

Direct current excitation applied to the Dynamatic Drive coil modulates the strength of the magnetic fields and consequently, the amount of torque developed at any rate of slip between the rotating input and output members. So that the drive may satisfy load and speed demands, this direct current must be varied automatically.

Because of the drive's small power demands, rectification of easily available alternating current to direct current is a simple procedure. A gas-filled thyratron tube is all that is needed to accomplish the conversion from AC to DC. A rectifier used in conjunction with the thyratron tube, plus the highly inductive eddy-current drive coil, provides a smooth flow of direct current as required by the drive.

To obtain desired performance, a means of varying the amount of current to the drive coil must be provided. The thyratron tube provides this function in that the grid of the tube, influenced by an AC rider wave imposed upon the DC grid voltage, permits a smooth change in drive coil voltage from zero up to the available maximum.

A permanent magnet alternator, driven by the output shaft of the Dynamatic Drive, generates a voltage in direct proportion to speed. This voltage directed to the electronic control is utilized to maintain pre-set speed. With a reduction in load, speed tends to increase, but the generator signals the control so that the drive coil current decreases, slowing down the unit. Conversely, should the load increase, the drive tends to slow down so that the generator signal to the electronic control automatically increases the current, permitting the drive to return to the pre-set speed.

Speed and load (current) control are two of the standard types of electronic controls available. Because of the almost unlimited uses and adaptations of electronic components, many operations can be conveniently controlled, such as tension, acceleration, braking, threading, jogging, speed matching, and many others where an electrical signal can be fed to the control equipment.

Send for our 16-page Illustrated Bulletin on Electronic Controls

EATON MANUFACTURING COMPANY
DYNAMATIC DIVISION
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VALUABLE DIE-SET DATA FOR ALL TOOL ENGINEERS

It's easy-to-look-at! More than 200 pages are specially edited and arranged for quick and simple reference. Full color is used to make tables easier to read, illustrations more clear. The easy-to-look-at format plainly indicates all optional features. Covering the complete Danly "Leadership Line", this catalog presents full dimensional data and specifications for all Danly Die-Sets, Diemakers' Supplies, Bolster Plates and Bolster Plate Accessories. Get your copy of this new easy-to-look-at Danly catalog. *Write for it today.*

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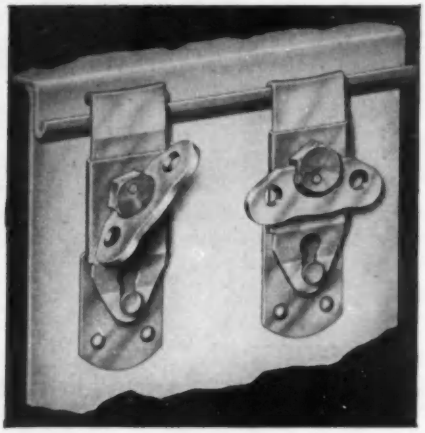
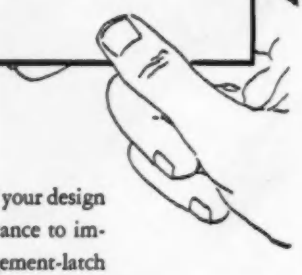
Have you a similar fastening problem?

File: Simmons LINK-LOCK



When the armed forces needed a positive, high-strength fastening device for instrument housings, transit cases, and storage boxes, Simmons developed LINK-LOCK. This *brand-new* device doesn't use springs, yet works with fingertip pressure through a unique mechanical arrangement: the vertical sliding latch is moved in and out of locking position by a disc rotated with a wing nut. The fastener is immune to low temperatures, is easy to operate even with arctic mittens, furnishes up to 450-lb. pull-down pressure. Open or closed, it lies flat against the side of the case it fastens.



LINK-LOCK may be the answer to your fastening problem. If your design involves heavy fastening pressures, watertight sealing, high strength, resistance to impact, ask about LINK-LOCK. Simmons can furnish it with special engagement-latch details, or for operation by bolt or screwhead instead of wing nut. Write for LINK-LOCK DATA SHEET today. It gives complete details and dimensions. A Simmons engineer will be glad to work with you on your fastening problems.

SIMMONS FASTENER CORPORATION, 1749 No. Broadway, Albany 1, New York

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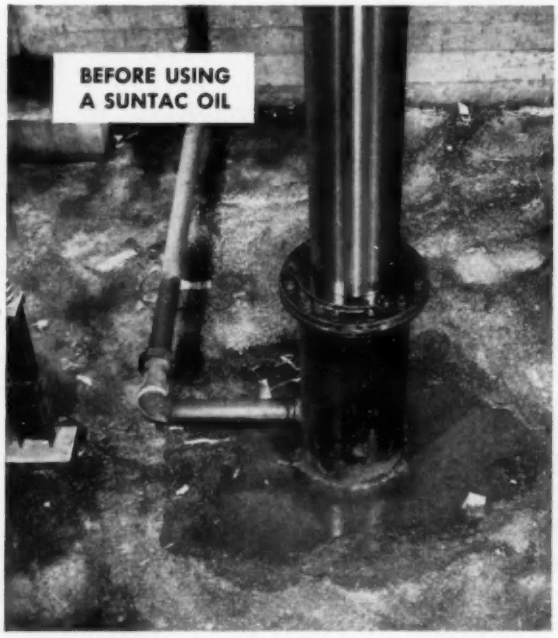

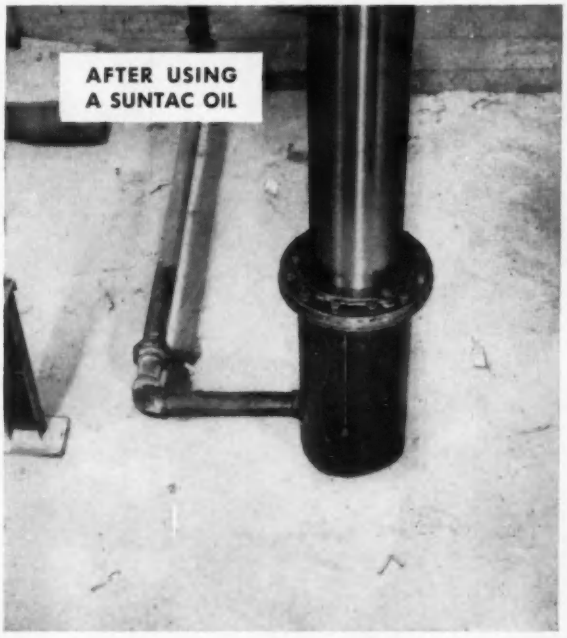

SUNTAC CUTS OIL WASTE, MAINTENANCE COSTS

High quality Suntac oils reduce drip...throw-off...squeeze-out... cut leakage an average of 35% and up to 90% in some cases.

Before using Suntac oil, a prominent eastern manufacturer had to add excessive make-up oil to the hydraulic system of his freight elevator. Oil leakage caused a continual housekeeping problem...the pit had to be cleaned out every six to eight weeks and maintenance costs were high.

Now, one year after switching to a Suntac oil, make-up has been drastically reduced, and frequent pit clean-ups are no longer necessary.

The reason: Suntac oils are specially compounded oils with adhesive-cohesive characteristics that enable them to cling to parts where other oils would drip, throw-off, leak, and squeeze out.

For complete information about Suntac oils, see your Sun representative, or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AA-4.

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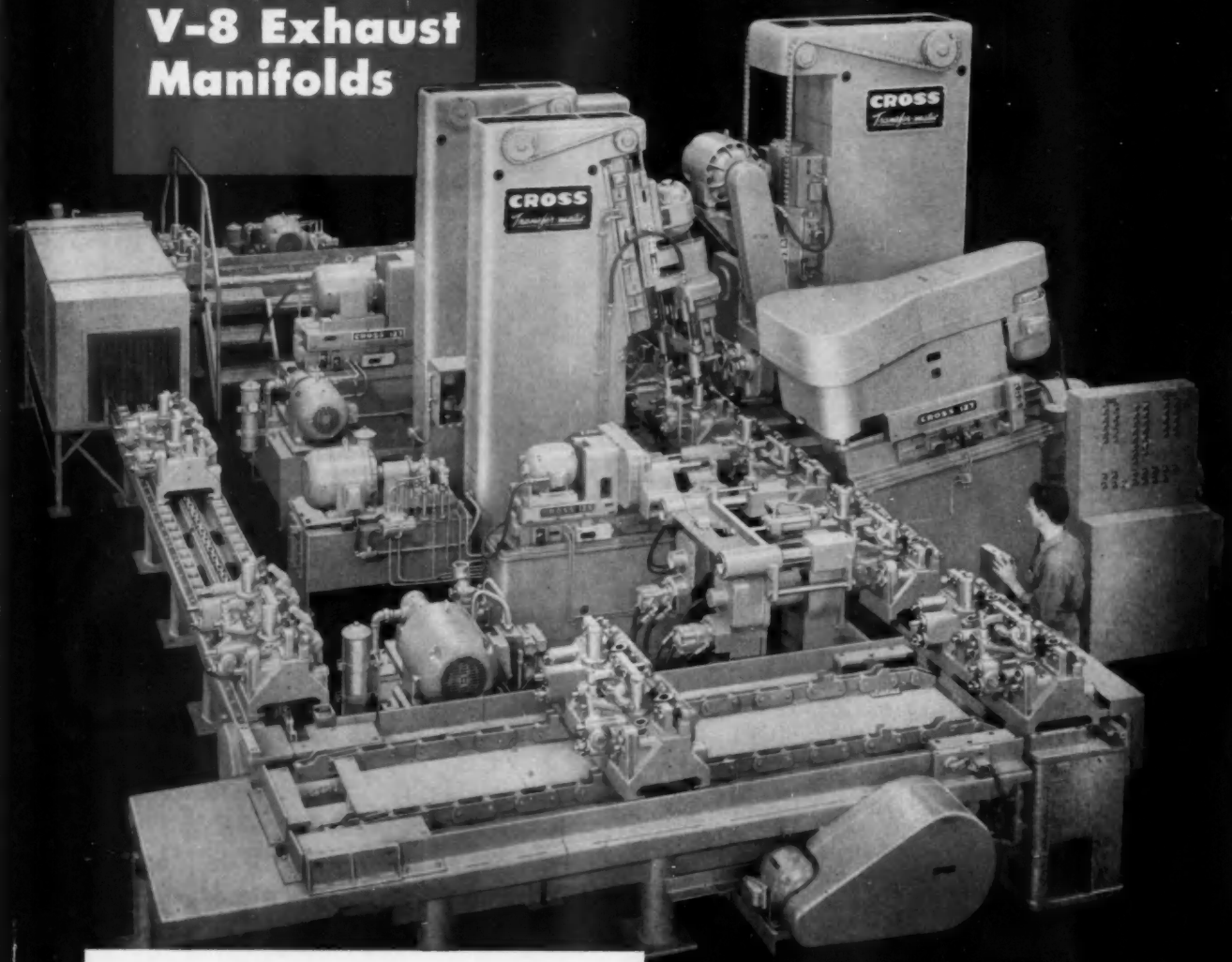
INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY, PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

Completely Machines V-8 Exhaust Manifolds

Another Transfer-matic by Cross



- ★ 51 operations: 8 milling; 37 drilling, chamfering and spotfacing; and 6 tapping.
- ★ Palletized work holding fixtures for holding one right hand and one left hand part.
- ★ Automatic power wrench for operating work holding fixtures.
- ★ Automatic transfer mechanism.
- ★ All parts in Cross machines—even tooling details—are made to interchangeable tolerances for fast, easy maintenance.
- ★ Other features: Construction to JIC standards; hardened and ground ways; hydraulic feed and rapid traverse for milling, drilling and boring; individual lead screw feed for tapping.

Established 1898

THE CROSS CO.

First in Automation

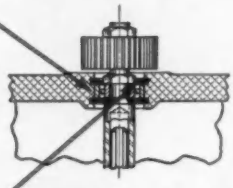
DETROIT 7, MICHIGAN

4 Waldes Truarc Rings Cut Costs Drastically, Increase Versatility of Precision Automatic Drill

Dumore's New Automatic Drill

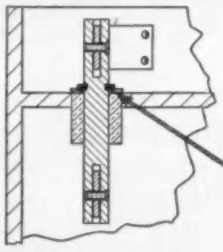
Dumore Precision Tools, Racine, Wisconsin, uses 4 Waldes Truarc Retaining Rings in their versatile new automatic drill unit. Machining operations have been eliminated, assembly simplified. Great labor savings have resulted from use of Truarc rings.

Drive Spindle Assembly



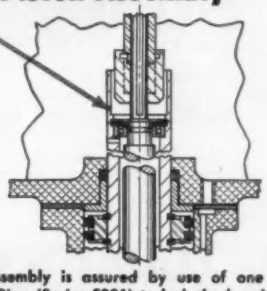
Bearing is held in position by two Waldes Truarc Rings—Standard (Series 5000) and Bowed (Series 5001). Two grooves are turned and housing rough bored in one operation. Alternate method would require at least two additional machining operations. Bowed Truarc ring takes up accumulated tolerances resiliently.

Actuator Lever Shaft Assembly



A Single Waldes Truarc External Retaining Ring (Series 5100) acts as shoulder, holds the lever in position. Labor savings are tremendous—a simple groove cutting operation replaces turning a shoulder, grinding and polishing.

Piston Assembly



Easy assembly is assured by use of one Waldes Truarc Bowed Ring (Series 5001) to lock the bearing to the piston assembly. When unit is to be used in tapping applications, entire spindle assembly can be removed without disassembly.

Whatever you make, there's a Waldes Truarc Retaining Ring designed to improve your product...to save you material, machining and labor costs. They're quick and easy to assemble and disassemble, and they do a better job of holding parts together. Truarc rings are precision engineered and precision made, quality controlled from raw material to finished ring.

36 functionally different types...as many as 97 different sizes within a type...5 metal specifications and 14 different finishes. Truarc rings are available from 90 stocking points throughout the U.S.A. and Canada.

More than 30 engineering-minded factory representatives and 700 field men are available to you on call. Send us your blueprints today...let our Truarc engineers help you solve design, assembly and production problems...without obligation.

For precision internal grooving and undercutting . . .Waldes Truarc Grooving Tool!

Send for new catalog supplement

WALDES

TRUARC®

RETAINING RINGS

Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.
Please send the new supplement No. 1 which brings Truarc Catalog RR 9-52 up to date.
(Please print)

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AY048

WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.

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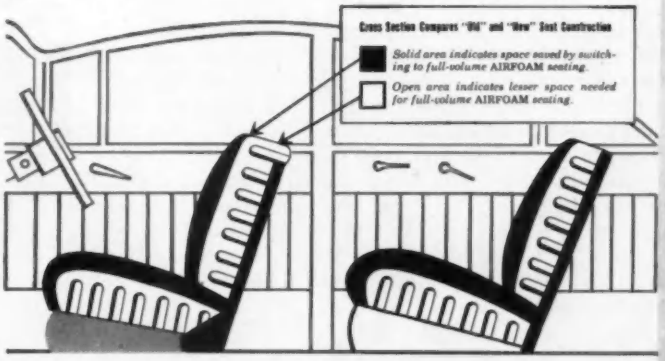
Airfoam MADE ONLY BY **GOODYEAR**

THE WORLD'S FINEST, MOST MODERN CUSHIONING

When the Mountainous Maxwell was smart design— so was bulky seating!

How **AIRFOAM** creates sales by creating **R-O-O-M FOR COMFORT**



AIRFOAM makes interiors roomier, more luxurious

Exciting new seating ideas become practical with **AIRFOAM**

Premolded **AIRFOAM** replaces expensive handwork — looks even richer

AIRFOAM can be your greatest sales-aid in years

FOREMOST AUTOMOBILE MAKERS are tackling the interior space problem with vigor and practicality—and AIRFOAM Development Engineers are helping in a big way.

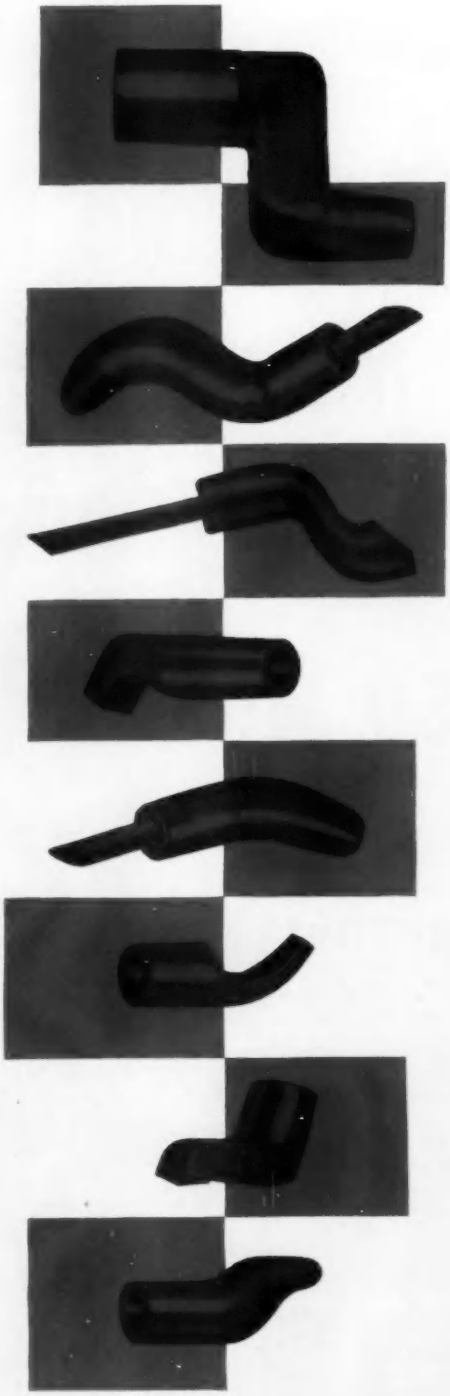
MUCH HAS ALREADY BEEN DONE. New AIRFOAM seat-units are replacing old-time bulky assemblies—and interiors are gaining style, glamour and comfort, together with priceless R-O-O-M!

MORE OF SUCH SALES-BOOSTERS ARE ON THE WAY. You may find it to your advantage to learn more about them—for they fill a real need of all the industry. Goodyear, Automotive Products Dept., Akron 16, Ohio.

Airfoam—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

Pick Your Special Electrodes

From Hundreds of Existing MALLORY Designs



Need odd-shaped electrodes for resistance welding around corners, inside channels, or other out-of-the-ordinary places?

Before you go to the time and expense of ordering custom-made special electrodes, see what Mallory existing designs can do for your job. We have flexible tooling available for hundreds of different odd-shaped electrodes. What you consider a "special" may well be an existing Mallory type that you can get on prompt delivery . . . and at economical cost.

Included in the Mallory line are cold formed single bend and double bend types. Also, cast and forged offset designs. You have a wide choice of nose shapes, tapers and lengths. Bent electrodes are made by an exclusive Mallory cold-forming technique which develops maximum strength and hardness, to assure long life. Both single and double bend types can be supplied with fluted cooling holes and water tubes bent in place*, to assure highly efficient cooling right up to the welding face. All types use specialized alloys and manufacturing methods which Mallory has developed during thirty years of pioneering and leadership in the resistance welding field.

Stock Mallory straight electrodes, holders, seam welding wheels, dies, forgings and castings are listed in the latest edition of our Resistance Welding Catalog. Write today for this valuable reference book . . . and see your local Mallory welding distributor for prompt delivery of high quality welding supplies.

*Patent No. 2,489,993.

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Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

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For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

a new development in powdered metals

Quali-SINT is the latest addition to the extensive manufacturing facilities of Burgess-Norton, producers of precision parts for industry for over 50 years. The development of Quali-SINT is the result of an intensive program of research and production, and represents the highest degree of sintered metal skill commercially possible. This superior quality is produced by teaming the most advanced materials, methods and equipment with the highly developed Burgess-Norton system of quality control.

What *Quali-SINT* means to industry

GREATER STRENGTH

Basic minimum tensile for Quali-SINT parts is 50,000 psi and minimum density is 6.2 g/cc. This greater strength permits a much broader use of Quali-SINT parts than ordinary sintered metal parts.

GREATER UNIFORMITY

Exclusive B-N controls in tooling, blending, compacting, sintering and inspection provide unmatched uniformity in both structure and dimension...from part-to-part and run-to-run.

LOWER FINAL COSTS

The closer tolerances and rigid adherence to specifications cut costs by reducing or completely eliminating many subsequent operations such as machining, cleaning and inspection at the user's plant.

SEND for this informative brochure on

Quali-SINT

another development in precision parts production by

BURGESS-NORTON
Mfg. Co. Geneva, Illinois

Creative engineering has long been identified with McQuay-Norris. From this pioneering spirit have come some notable achievements: *phosalloy . . . Chrome-Control . . .* the *400 oil ring.* If our progressive design and production facilities can serve you, we cordially invite your inquiry.

McQUAY-NORRIS

PISTON RINGS . . . HARDENED AND GROUND PARTS

McQUAY-NORRIS MANUFACTURING COMPANY
ST. LOUIS 10, MISSOURI

All-weather Brown thermocouple head saves time and trouble

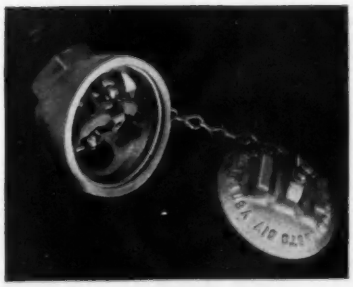
Like the other function-designed supplies in the Brown pyrometer accessories line, the screw type thermocouple head is engineered for the top in utility and convenience.

It can't freeze or rust. Threads are cut on the *inside* of the head, where they are protected from external moisture and corrosive atmospheres. The threads are plated and enameled *after* machining . . . to assure that a complete protective finish covers the thread surfaces. The entire head is hot dip galvanized and enameled for maximum weathering properties. A heat and moisture resistant gasket seals the thermocouple and extension wire connections from the damaging effects of outside atmospheres.

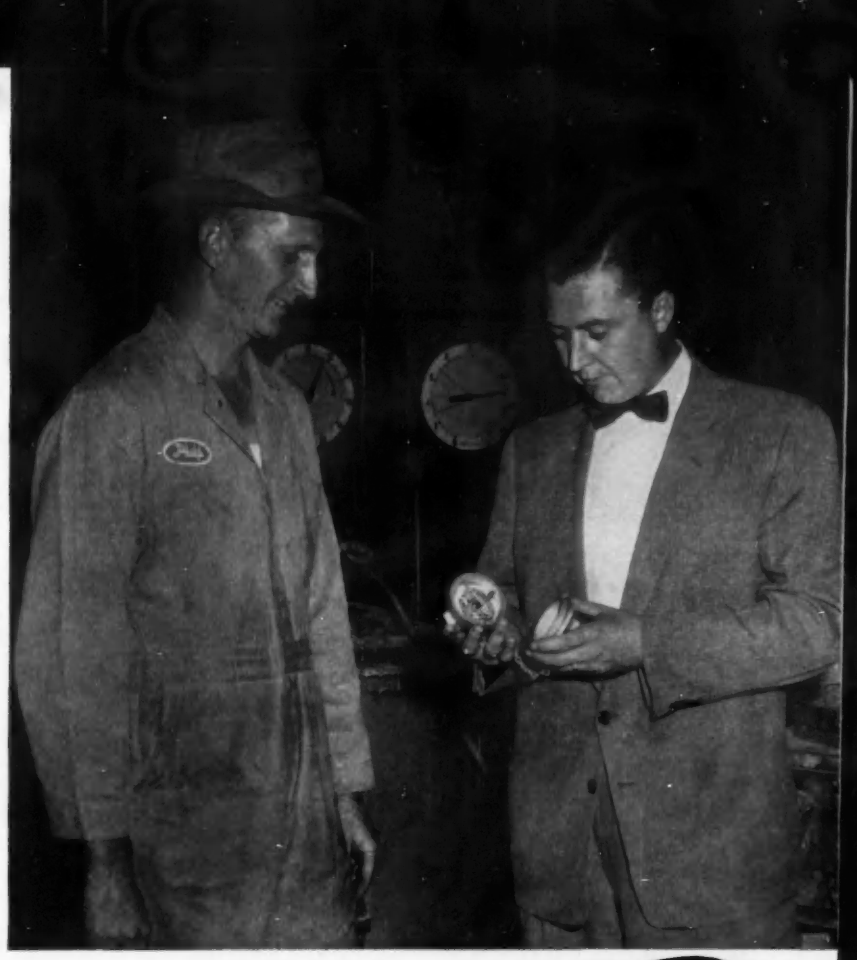
It's built for convenience. You need no special tools. The slotted head makes it easy to remove or to tighten the head without using a wrench. A chain connects the head to the base . . . prevents waste of time for recovering a head that drops off.

It's versatile. It can accommodate terminal blocks for either single or duplex thermocouples or resistance thermometers.

It uses standard pipe thread outlets, and is interchangeable with other heads.



The Brown screw type thermocouple head is recommended for outdoor service, and for applications where atmospheres are corrosive. Its general versatility, however, makes it useful in so many other installations that you should consider it for any spot where thermocouple connections may give trouble. Your local HSM will be glad to look over the requirements of your specific location, and to help you choose the type of thermocouple head that best fits the job.



Here's why it pays to know your HSM

HONEYWELL SUPPLIES MAN

HOWARD PALMER, *at right*, HSM (Honeywell Supplies Man) in the Philadelphia area, tells Philip Keidel, General Manager of Robert Wooler, Dresher, Pennsylvania about the corrosion-proof construction of Brown Screw Cover Type Terminal Heads for thermocouples.

The HSM Plan for buying pyrometer supplies not only assures you of getting the best in quality from the complete line of Brown accessories . . . but, through personalized analysis of your specific problems, it places all your supplies purchasing on a planned basis that can cut your inventory needs, simplify your paper work, and often reduce overall costs substantially.

Ask your local HSM to discuss how this plan can operate in your own plant. Call him at your nearby Honeywell office . . . as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

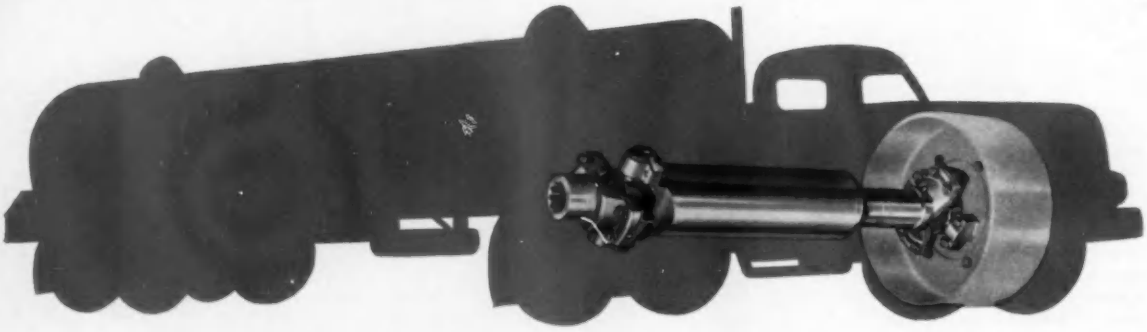
● **REFERENCE DATA:** Write for the booklet, "The HSM Plan" . . . and for Pyrometer Supplies Buyers' Guide No. 160-6.

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

First in Controls

RUGGED



Manufacturers of the big diesel transports, that must stand up under hour-after-hour of gruelling service, have learned to rely upon MECHANICS Roller Bearing UNIVERSAL JOINTS to deliver hundreds of thousands of miles of trouble-free service. Because MECHANICS JOINTS drive through KEYS—instead of bolts—they stand up under punishment that shears off other types of fasteners. They are designed with less parts and connections for easy assembly and servicing—smooth running balance—maximum strength with less weight—and long, trouble-free, safe operation. Rugged stamina is just one of the advantages you get when you specify MECHANICS Roller Bearing UNIVERSAL JOINTS. Let MECHANICS engineers help you design this and other competitive sales features into your product's transmission train.

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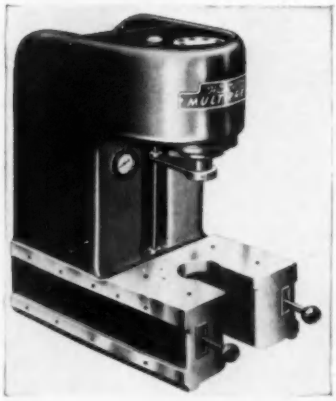
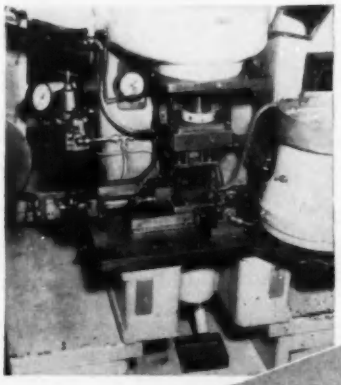
MULTIPRESS

Multipress® Automation turns out 48,000 assemblies a day

Denison Multipress pierces, forms, cuts off, positions and spot welds stainless strap to washers





100 assemblies per minute . . . that's the production turned out by one Denison Multipress at International Business Machine Corporation, Poughkeepsie, New York.

Stainless steel tape is fed through a hitch feed into a punch and die set where it is pierced, shaped, and cut off forming a damper guard to cushion the action of a relay armature. It is then positioned under welding electrodes and welded to a square steel washer.

All operations are automatic . . . accurately timed to the stroke of the ram.

Ask a Denison field engineer to show you how to put Multipress to work in your plant. He will demonstrate exactly where and how you can save money on your operations . . . now. Write us.

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DENISON ENGINEERING COMPANY
1212 Dublin Road • Columbus 16, Ohio
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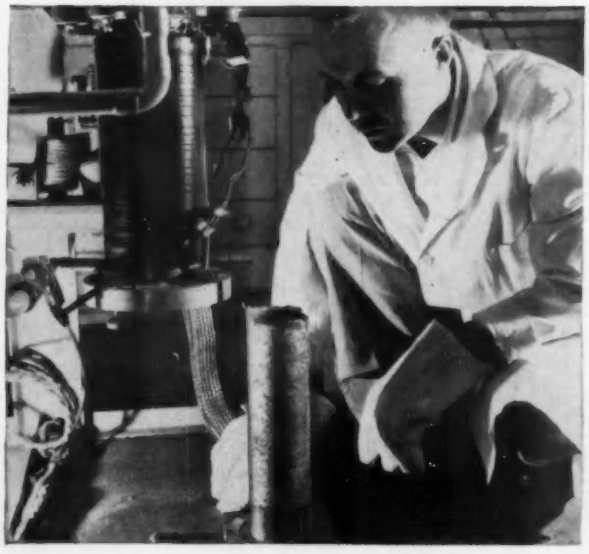


Research in titanium reduction and annealing by Dr. E. W. Johnson, Advisory Metallurgist, developed this vacuum arc furnace for commercial use. The consumable sponge titanium electrode, shown, is reduced to a highly pure titanium ingot.

Expanded design engineering is supervised by R. W. Brown, Engineering Manager, for Westinghouse gas and electric furnaces and atmosphere generators. Additional engineering facilities handle induction heating equipment.

Launching a new Industrial Heating Division

L. R. HAGUE OF WESTINGHOUSE CARRIES NEW PROFIT OPPORTUNITIES TO CUSTOMERS

Big and growing opportunities in metal treating are creating a need for broader equipment know-how and service. The answer to these needs is being put before customers by L. R. Hague, Division Manager, in over 10,000 miles of introducing Westinghouse major new Industrial Heating Division.

Cadre of key men

"Westinghouse new organization grows around key men with careers in metallurgical processing," reports Hague. "Their experience expedites problem solving on all types of equipment . . . gas and electric furnaces, atmosphere generators and induction heating equipment applications. Some of these involve more than one type of heat-treating and many installations incorporate work-handling advantages for in-line production."

Turn-key contracts

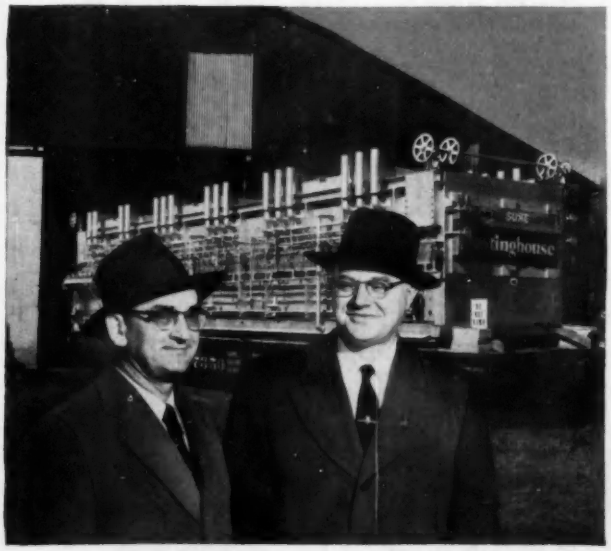
Manufacturing and field service organizations have expanded, too. They integrate their planning with customer timetables for equipment installation. Full erection and supervision of start-ups are provided in what Westinghouse calls *turn-key* contracts.

Research rapid

Hague points, in addition, to Westinghouse pioneering in new fields of metallurgy. "Developments in vacuum metallurgy, induction heating and other techniques are progressing rapidly," he said. "Equipment development is a part of Westinghouse large metallurgical research program."

On-the-spot planning

This year many plants plan heat-treating expansion. Many more will check heat-treating obsolescence—looking for troublemakers that cause extra handling, distortion, decarburization or scaling. "Call your local Westinghouse industrial heating sales engineer for counsel on these problems," Hague recommends. "He will bring broad equipment knowledge and service facilities for new profit opportunities." J-10449

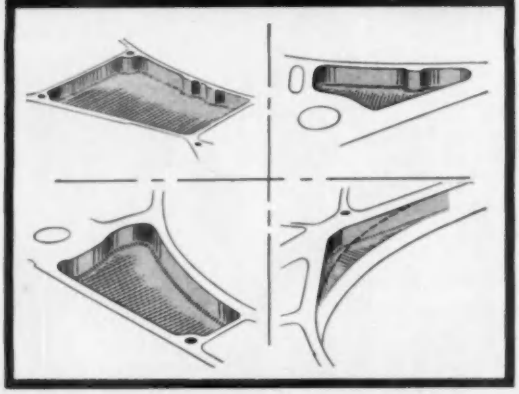


Project engineers, C. E. Peck and E. J. Seabold, work with Westinghouse customers in engineering, manufacture and installation of units such as this continuous annealing furnace, to be tested and ready to go in the customer's plant.

Industrial heating sales engineers are kept abreast of new developments and techniques in regular reviews with L. H. Gillette, Marketing Manager, and R. R. La Pelle, Furnace and Atmosphere Generator Application Manager.

Typical Cuts

Illustrated below are only a few of the many detail cuts that can be taken on bulkheads, wing spars, caps, etc.

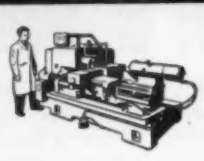


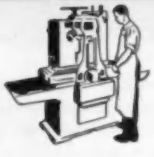
. . . SUNDSTRAND 3 DIMENSION TRACER MILLING UNIT

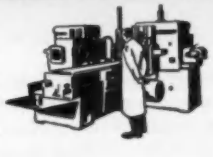
Here's a new milling unit designed for taking numerous small irregularly shaped cuts on large work pieces. The unit is self contained and can easily be moved to many different cutting positions around a large work part. If desired, several units can be mounted to a simple sub-base to provide a multi-station machine. As the cutter moves rather than the work piece itself, less floor

SUNDSTRAND "Engineered Production" Service* *REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS

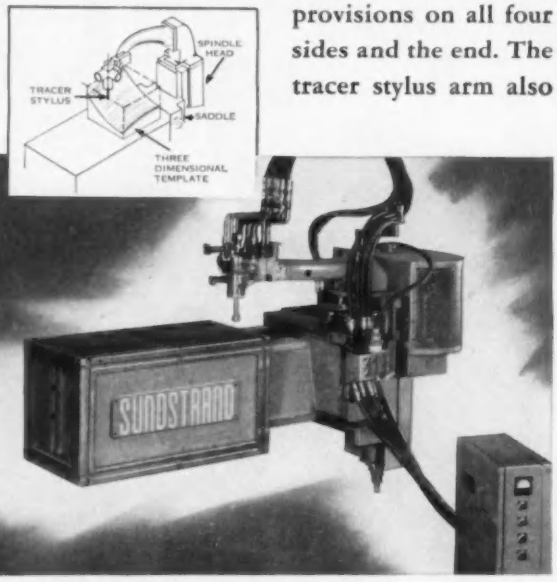






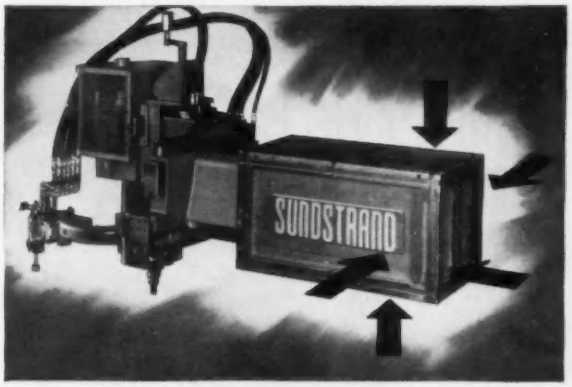
space is required to do the work and greater accuracy can be maintained. Because the unit can be readily positioned, changes in product design can quickly be accommodated without obsoleting the basic equipment.

The ram support of the unit has transverse and longitudinal keyways with suitable mounting provisions on all four sides and the end. The tracer stylus arm also has several manual mounting positions to further increase the possible uses of the unit.



Tracer unit showing application of template (in sketch).

The transverse and longitudinal movements of the cutter are 12 inches with a depth movement of 8 inches. All three movements are manually controlled from a single pencil type stylus tracing unit to enable duplication of the template on the work piece. Each movement has a quick shut-off valve for independent use of any one movement. The cutter head slide has a micrometer screw depth stop for accurate depth location for the full range of cutter travel. The linear and depth duplicating speed of the cutter is variable within a range of 1″ to 50″ per minute.



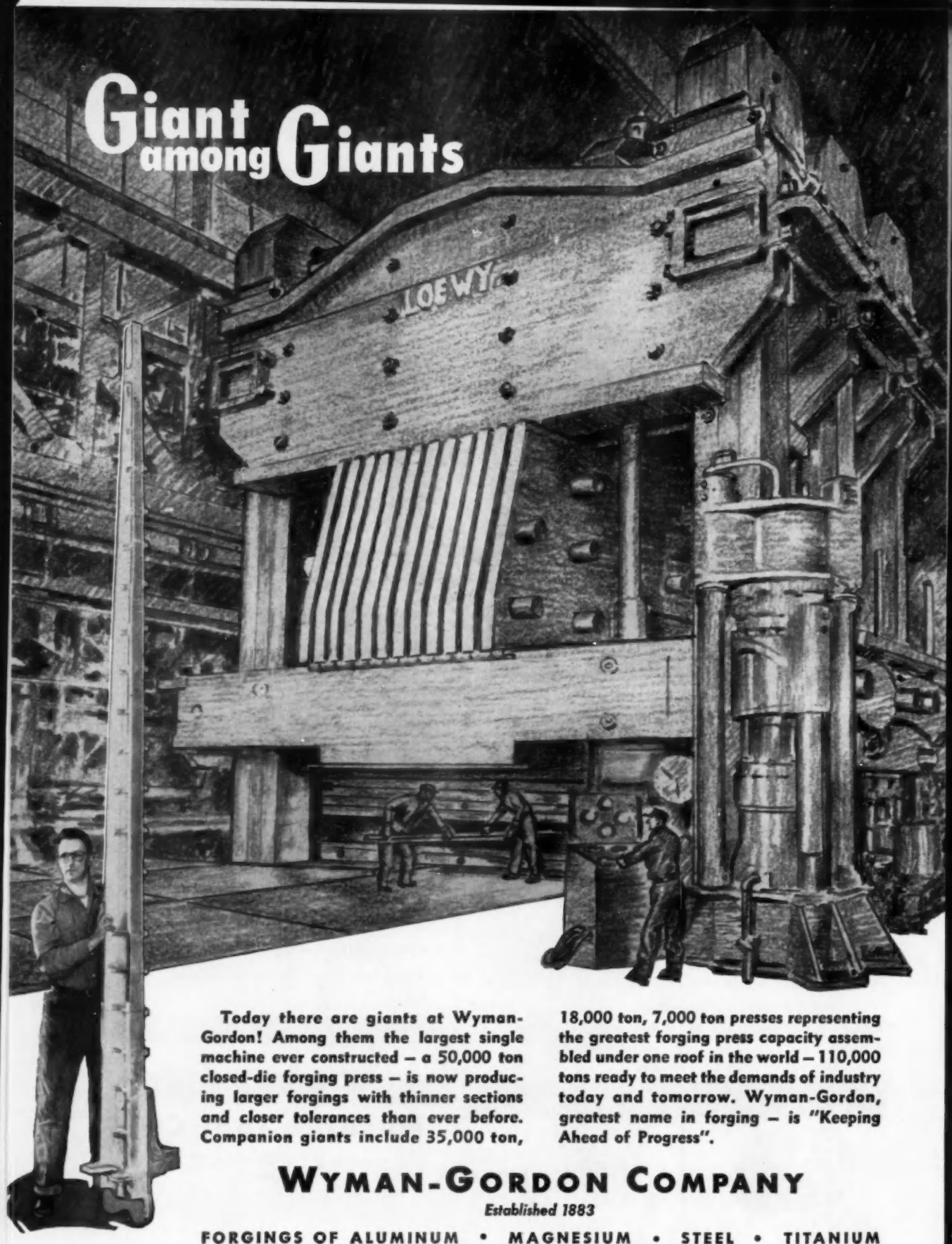
Tracer unit showing mounting provisions on all four sides and end.

The stylus has a positive lock adjustment on all three movements to enable the locating of the cutter in relation to the stylus on the template. To allow for the changing of various size tracing stylus without changing the cutter, a quick change positive lock stylus chuck has been provided.

The unit shown has a belt driven 3 h.p. head with 4 possible speed changes of 200, 400, 900 and 1800 r.p.m. Also available is a 3 h.p. head with infinitely variable speeds between the range of 200 to 1800 r.p.m. In addition, 5 h.p. heads of either the 4 speed belt driven type or the infinitely variable speed type can be furnished.

Additional Data

covering this unit is available upon request. Write for this information today. Ask for Bulletin 266.



Today there are giants at Wyman-Gordon! Among them the largest single machine ever constructed – a 50,000 ton closed-die forging press – is now producing larger forgings with thinner sections and closer tolerances than ever before. Companion giants include 35,000 ton, 18,000 ton, 7,000 ton presses representing the greatest forging press capacity assembled under one roof in the world – 110,000 tons ready to meet the demands of industry today and tomorrow. Wyman-Gordon, greatest name in forging – is "Keeping Ahead of Progress".

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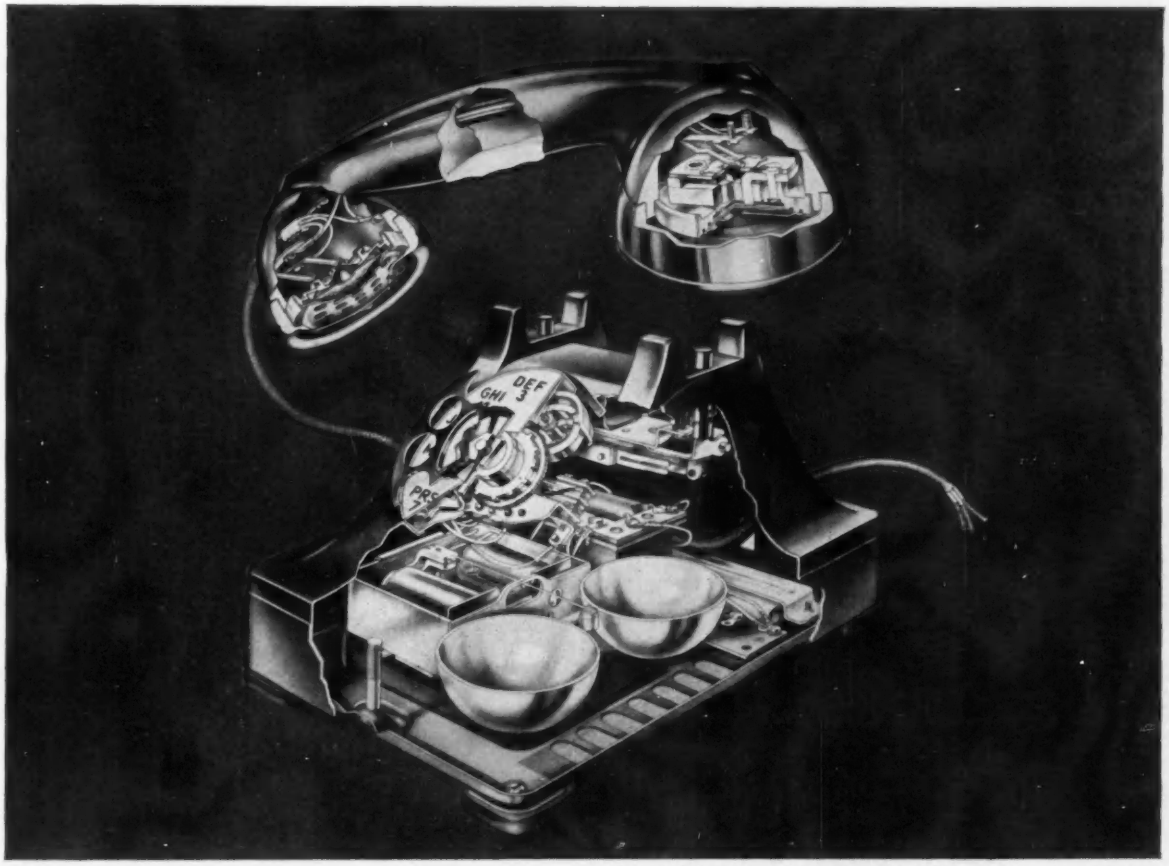

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Everyone who uses copper learns something from it . . . something no substitute can teach.

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And to the home-owner wise enough to install copper throughout his "castle", time itself tells an unending tale of trouble-free enjoyment.

Copper will speak for your product, too. It will signify *quality!*

It costs you less to make your product well, before it is sold . . . than to make it good, afterwards.

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COPPER OR ITS ALLOYS PROVIDE THESE ADVANTAGES:

Best conductor of electricity commercially available

Does not rust . . . high corrosion resistance

Best heat transfer agent of all commercial metals

Easy to machine, form, draw, stamp, polish, plate, etc.

Welds readily . . . excellent for soldering and brazing

CALENDAR

OF COMING SHOWS AND MEETINGS

ASLE Annual Meeting, William Penn Hotel, Pittsburgh, Pa..April 4-6
American Chemical Society, national meeting, Statler-Hilton Hotel, Dallas, Tex. .....April 8-13
SAE Aeronautic Meeting and Production Forum, and Aircraft Engineering Display, Hotel Statler, New York, N. Y. ..April 9-12
National Packaging Exposition, Convention Hall, Atlantic City N. J. .....April 9-12
MPA Annual Meeting and Metal Powder Show, Hotel Cleveland, Cleveland, O. .....April 10-12
National Industrial Research Conference, Sherman Hotel, Chicago, Ill. .....April 18-19
National Petroleum Institute, semi-annual meeting, Cleveland Hotel, Cleveland, O. .....April 18-20
Tokyo Motor Show, Japan.....April 20-29
American Zinc Institute, annual meeting, Hotel Statler, St. Louis, Mo. .....April 23-24
Turin Motor Show, Italy..April 21-May 2
British Industries Fair, London and Birmingham, England.April 23-May 4
International Automobile Show, Coliseum, New York, N. Y. April 28-May 6
German Industries Fair, Hannover April 29-May 8
U. S. Chamber of Commerce Annual Meeting Wash. D. C. .April 30-May 2
AFS Castings Congress and Show, Atlantic City, N. J.....May 3-9
AWS Spring Meeting and Fourth Welding & Allied Industry Exposition, Buffalo, N. Y. .....May 8-11
Western Material Handling Conference and Equipment Show, Los Angeles, Calif. .....May 9-11
Mechanical Handling Exhibition and Convention, Earls Court, London, England .....May 9-19
Design Engineering Show, Convention Hall, Philadelphia, Pa..May 14-17
Automotive Advertisers Council, spring meeting, Homestead, Hot Springs, Va. .....May 22-25
Production Machine Tool Hydraulic Forum, Engr. Soc. Bldg., Detroit, Mich. .....May 24-25
National Fluid Power Association annual meeting, Greenbrier, White Sulphur Springs, W. Va. May 28-30
Indianapolis 500-Mile Race .....May 30
AGMA Annual Meeting, Homestead, Hot Springs, Va. .....June 3-6
SAE Summer Meeting, Chalfonte-Haddon Hall, Atlantic City N. J. .....June 3-8
Material Handling Institute 1956 Exposition, Public Auditorium Cleveland, O. .....June 5-8
ASQC Annual Convention Palais du Commerce, Montreal, Canada .....June 6-8
Seventh National Plastics Exposition, Coliseum, New York, N. Y. June 11-15
National Truck, Trailer and Equipment Show, Los Angeles, Calif. June 14-17
ASTM Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. .....June 17-22
International Machine Tool Exhibition, London, England.June 22-July 6
SAE National West Coast Meeting, Mark Hopkins Hotel, San Francisco, Calif. .....Aug. 6-8

Up to 40% higher tightening torques — a feature of new High Torque Unbrako socket set screws

RECOMMENDED SOCKET SET SCREW TIGHTENING TORQUES
(Inch-Pounds)

SCREW SIZE	UNBRAKO	SET SCREW B	SET SCREW C	MINIMUM DIFFERENTIAL %
#4	5	3.9	3.5	28
#5	9	7.8	7.4	15
#6	9	7.8	7.4	15
#8	20	14.7	14.5	36
#10	33	26.5	25	25
1/4	87	62	60	40
5/16	165	122	125	32
3/8	290	198	225	29
7/16	430	309	350	23
1/2	620	460	500	24
5/8	1225	1106	1060	11
3/4	2125	1540	1800	18
7/8	5000	3660	4600	9
1	7000	5025	6500	8

Compare UNBRAKO-recommended tightening torques with those of ordinary socket set screws and you readily see why you can set an UNBRAKO and then forget it. The reasons are simple. UNBRAKOS have deeper sockets, which give you better purchase with the wrench; rounded socket corners, which eliminate the sharp corners where cracks start; fully formed threads, which make them stronger; and knurled cup points, which keep them tight.

Let's see just how the development of fully formed threads make the new High-Torque UNBRAKO stronger. The metal is compressed into the closely knit grain structure that you see in the illustration. The grain flow follows the contour of the threads. There are no straight lines along which shear can occur. An UNBRAKO retains its flow lines even when ground down to .010" below root diameter. Conversely, cut or ground threads have straight flow lines—lose thread form at root diameter.

You can't buy a better screw than an UNBRAKO. And you can't get full *high-torque* performance without a "High-Titan" UNBRAKO Hex Key—the high-ductility, precision internal wrenching tool. See your authorized distributor today. Or write STANDARD PRESSED STEEL CO., Jenkintown 53, Pa.

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UNBRAKO® SOCKET SCREW DIVISION SPS
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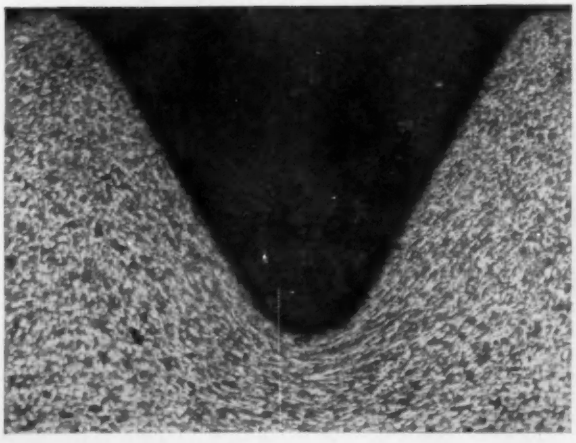
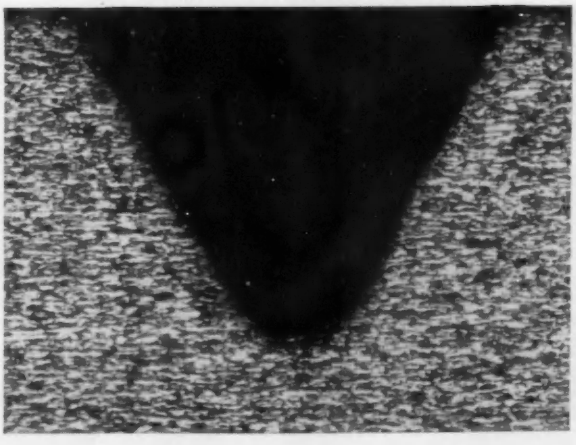
UNBRAKO SET SCREW THREADS



ORDINARY SET SCREW THREADS



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This industry-wide acceptance of the most revolutionary development in braking since Bendix four-wheel brakes is convincing evidence of Bendix foresight in research and engineering. And the fact that today more Bendix Power Brakes are in use than all other makes combined demonstrates conclusively the ability of Bendix to *produce* as well as to *plan ahead* for the industry's requirements.

Available in low pedal or high pedal designs to meet individual manufacturers' requirements, Bendix Power Brakes are a potent source of customer good will from the first mile to trade-in time.

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Export Sales and Service: Bendix International Division, 205 East 42nd Street, New York 17, N. Y.

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High Spots of This Issue

★ Chrysler's Canadian Engine Plant

Automation is making itself felt more and more in manufacturing operations conducted by our Good Neighbor to the North. Surveyed here is the wealth of modern tooling used by Chrysler Corp. of Canada in its output. See Page 48.

★ Army Ordnance Reveals New Engine Development Program

One highlight of the SAE Passenger Car, Body and Materials Meeting last month was the disclosure by Army Ordnance of a program to develop new engines to power small vehicles. Other design problems were also studied. Page 52.

★ Automated Press Line in Ford Cleveland Stamping Plant

Now in operation is what may be termed the very latest word in automated stamping plants. The author conducts the reader on a graphic tour of the facility, which supplies about 20 per cent of major Ford body stampings. Page 60.

★ Allison Six-Speed Automatic Transmission Production

In spite of special limitations involved in the making of transmissions for Chevrolet trucks, Allison has utilized its manufacturing facilities to best advantage for the job. The techniques employed are described here. Page 66.

★ Swedish Car Manufacturer Has Modern Paint Shop

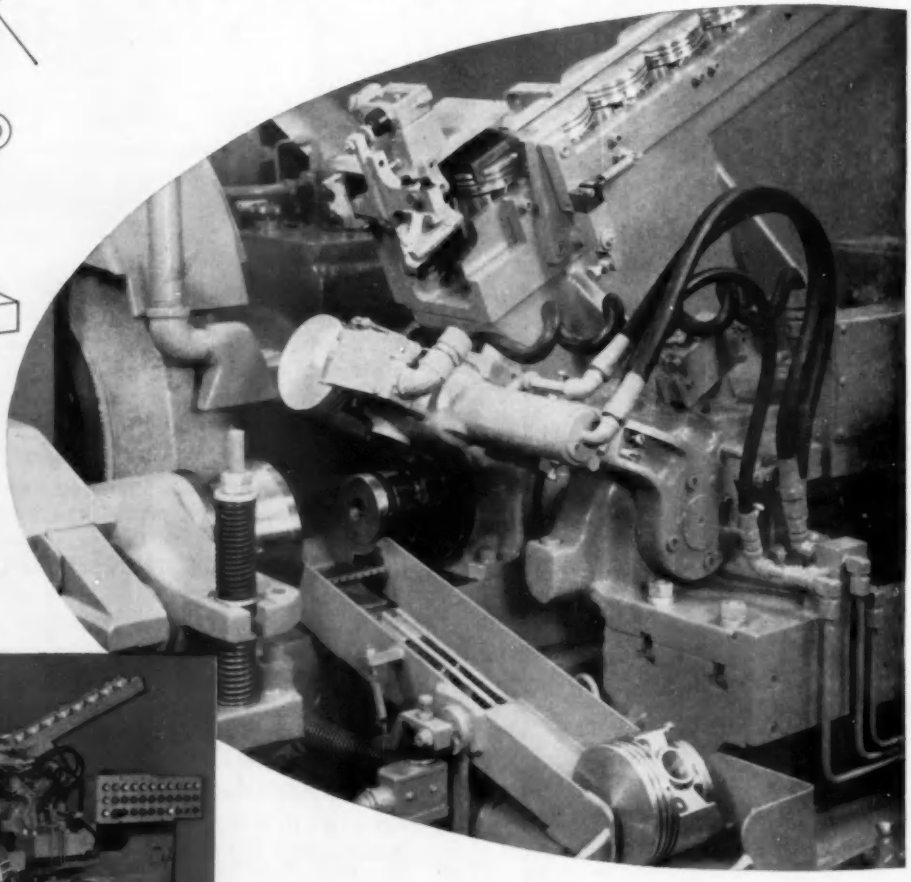
Presented in this article is a detailed description of a streamlined setup in Scandinavia for painting vehicle bodies. Volvo, major Swedish automotive producer, has developed carefully planned facilities for this work. Page 70.

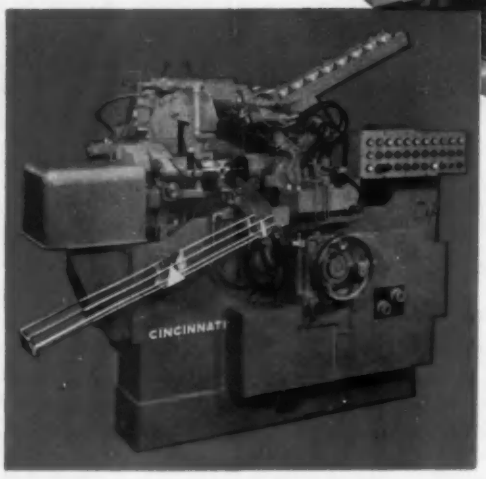
★ 34 New Product Items And Other High Spots, Such As:

Molding epoxy resins; automotive rubber bushings turned out; Renault rear-engine car; AIIE conference; integral tank sealant application; and brake anchor pin installation.

Fully Automated Cincinnati FILMATIC Centertype Grinding Machine

Grinds 130 automotive pistons per hour





Grinding oval skirt diameters on 130 pistons per hour. The machine is a CINCINNATI® FILMATIC Automatic Centertype Grinder. Close-up shown above.

The machine illustrated here is one of several CINCINNATI® FILMATIC Plain Hydraulic Grinders developed to automatically grind the oval skirt diameter on automotive pistons. If desired, the entire operation proceeds automatically, from loading to sizing and wheel dressing. From this machine, the parts are automatically conveyed to the next unit. There's never a delay in production, for CINCINNATI FILMATIC grinding wheel spindle bearings, imaginative engineering service, and the industry's widest variety of centertype and centerless grinding machines is a team that just can't be beat anywhere. Be sure to consult Cincinnati for your next precision production equipment. You'll save money by doing so.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 114, No. 7 **April 1, 1956**

Mercury Div. Breaks Ground For Second Largest Facility

Since California is now the No. 2 state in automobile production, many car companies are expanding their production facilities in that state to match increased sales. Mercury on March 23 broke ground for its new 1.4 million sq ft plant in the Los Angeles area.

When completed, the new facility will have a capacity to turn out 175,000 cars annually. This total will be more than double the capacity at the present plant in Maywood, which will be abandoned.

Surpassed in floor area only by the Wayne, Mich., Mercury plant, the new plant will be located on a 200-acre site. The car assembly structure will occupy 1.1 million sq ft of floor area. A two-story administration building will be constructed adjacent to the assembly area. Production is scheduled to begin in June, 1957.

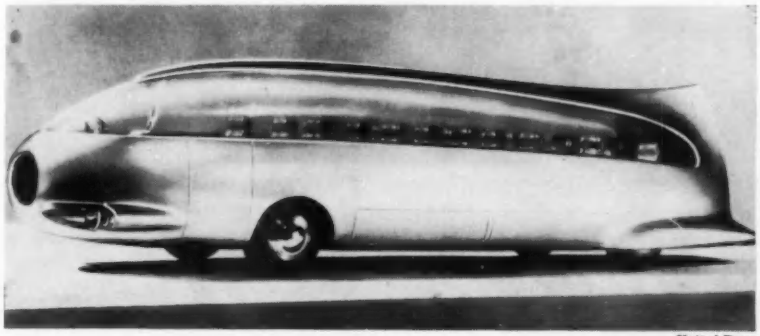
Illustrating the growth in the automobile sales market in California, Mercury notes that its sales in that state climbed to 47,229 units last year from 12,438 in 1948. Combined industry sales in that state last year aggregated 665,892 units, against 272,209 eight years ago.

B-O-P Plant to Be Erected On Pacific Coast Very Soon

General Motors will start construction shortly on a new B-O-P assembly plant in the San Francisco-Oakland Bay Area. Exact location of the 1.5 million sq ft plant will be announced as soon as the 200-acre plant site purchase is completed.

The new facility will be in operation in time to produce 1958 models of Buicks, Oldsmobiles, and Pontiacs. It will have an annual productive capacity of 100,000 cars.

GM said it was building the new plant to meet the expanded demand for cars on the West Coast. It will serve California, Oregon, and Washington and will bring to eight the number of B-O-P Assembly Div. plants in the U. S.



United Press

GAS-TURBINE-POWERED BUS WITH PLASTIC BODY

The Italian concern of Viberti has unveiled an experimental plastic bus powered by a gas turbine engine. Christened the Golden Dolphin, it reportedly will be built in both 18 and 32-seat models and will have an estimated cruising speed of about 125 mph.

Chevrolet Expands Facilities For Transmission Production

Since demand for automatic transmissions is on the upgrade, Chevrolet continues to expand its facilities for production of the units. Last month (March) the division acquired the Brown Trailer Co. plant in Toledo to supplement production at the 80,000 sq ft facility it bought from Martin-Parry Corp. last year. The Brown plant is adjacent to the Martin-Parry unit, where installation of machines for production of automatic transmission is underway.

Indicative of the upward trend in automatic transmission sales is a Chevrolet report which shows that the division installed 447,990 Powerglides on 1956 models through the end of February. The figure represents 63.4 per cent of total car production, compared with 51.4 per cent for the 1955 model run.

Ford Readies Aircraft Plant For Production Of Vehicles

With its Government contract scheduled to expire this June, the Ford Div. plant in Claycomo, Mo., is now being converted to vehicle production. Present plans call for the addition of 192,000 sq ft of floor space to the plant, which would bring total area to approximately 1.34 million sq ft.

Originally designed for automobile production, the plant turned out wings for B-47 jet bombers since 1953, and the final wing set was completed last month. Automobile production at the plant will get underway by the spring of 1957.

Cutler-Hammer Plans New Milwaukee Plant

Cutler-Hammer, Inc., manufacturer of electric motor controls, will build a 175,000 sq ft plant in Milwaukee, Wis., to supplement existing facilities in that city. Cost of the plant, which will employ about 350 persons when completed late this year, is estimated at $2 million.

News of the AUTOMOTIVE

Packard Executive model with special styling treatment and 275-hp engine.

Stock Purchase Program Is Planned By Chrysler

Chrysler Corp. is planning to offer a stock purchase plan to employes. While the basic program is the same as that now offered by General Motors and Ford, the Chrysler plan differs slightly in that the value is tied to the net return on sales performance of the company. As at GM and Ford, the stock will be made available only to salaried employes.

Under the Chrysler plan, to be voted on by stockholders at a meeting April 17, the corporation would contribute 40 cents for each $1 an employe invests in the program if net earnings do not exceed five per cent. If net earnings fall between 5 per cent and 7 per cent of net sales, the company would contribute 50 cents for every $1 invested by the employe. Contributions would be 60 cents if net earnings exceed seven per cent.

Shareholders Approve Kaiser Reorganization

Kaiser Motors Corp. last month (March) got authorization to reorganize, as 98 per cent of the voting stockholders approved plans to rename the concern Kaiser Industries Corp. First outlined several weeks ago, the plan will bring together all Kaiser companies under one corporate firm and enable Kaiser Motors stockholders to participate with Henry J. Kaiser and his associates in the various Kaiser enterprises.

Through an exchange of stock, Henry J. Kaiser Co. will become a wholly-owned subsidiary of Kaiser Motors, The plan also will result in the repayment of all of the presently outstanding indebtedness of Kaiser Motors, including the entire $13.3 million remaining amount due to the RFC. This is possible by an agreement by the new company and Henry J. Kaiser Co. with nine banks for a $95 million term loan and a revolving credit of $6.5 million for financing construction projects by Henry J. Kaiser Co.

Willys Motors will continue as a wholly-owned subsidiary of the new company. It also will be relieved of its present bank debt.

National Automobile Show To Be Staged in New York

The automobile industry will revive the National Automobile Show next December after a lapse of 16 years. The show will be held Dec. 8 to 16 at the New Coliseum in New York, which has 300,000 sq ft of exhibit space available.

Cars and trucks of American makes will be on display, but foreign manufacturers will not be invited to participate this year. It is possible that they may be included in future shows.

The number of car makes to be exhibited is expected to number 21, or possibly 23 if Packard's Caribbean and Cadillac's El Dorado are classified separately. Nineteen truck and/or coach makes are expected to be displayed by 18 manufacturers.

Packard Fills Price Gap With New Executive Car

Packard - Clipper Div. this month will announce a new line of cars called the Packard Executive. Basic purpose for introducing the new model is to close the price gap that has existed between the highest-priced Packard and the lowest-priced Clipper line. Industry observers see the new model as a direct competitor to Buick's Roadmaster series.

The new Executive line will have the front end styling of the regular Packard and the rear end of the Clipper, which will permit pricing of the car under the regular Packard line. It will be powered by the 275-hp Clipper engine.

While prices of the new Executive line were not available at press time, reliable sources indicated a fully-equipped four-door sedan would carry a retail delivered price of $4400. The hardtop may have a price tag of $4500, or approximately $600 to $700 under the lowest priced Packard.

New Departure Expanding Output of Small Bearings

In view of a trend toward usage of smaller ball bearings, New Departure Div. of General Motors Corp. plans to more than triple its yearly production rate of such bearings. The division plans to spend approximately $7 million to expand its engineering and manufacturing facilities at Sandusky, O., where it is currently producing about 11,500 miniature bearings a month. By the end of this year, the division hopes to be turning out small bearings at a yearly rate of 500,000 compared with 138,000 at present.

Ford Tractor Production Up 29 Per Cent Last Year

Although Ford last year built more farm tractors than in 1954, its percentage of the total industry market remained about the same. A report from the Tractor and Implement Div. shows the company produced 66,656 tractors in 1955 against 51,490 in the preceding year, a 29 per cent increase.

AND AVIATION INDUSTRIES

Wiles Takes Important Post In General Motors Hierarchy

The appointment of Ivan L. Wiles as an executive vice-president in charge of dealer relations at General Motors marks one of the most significant moves within the corporation's high echelon since Harlow H. Curtice became president of GM in 1953. Wiles, who has been general manager of Buick since 1948, assumes charge of a newly created department responsible only to the GM president. He also becomes the third executive vice-president of the corporation.

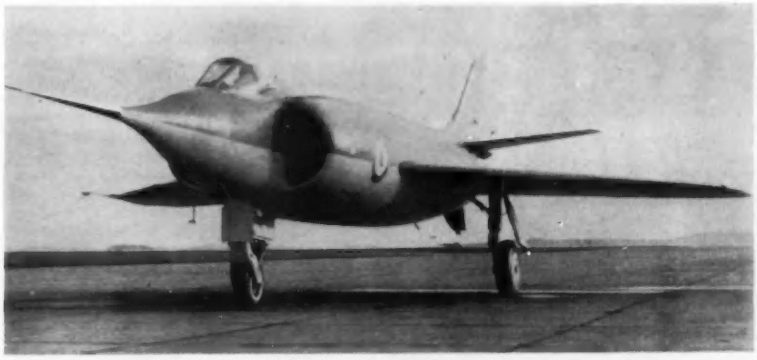
Mr. Wiles' appointment to the high position came on the heels of a series of broad changes in contracts with GM dealers. The newly created department will give dealers a direct line of communication to the top GM management. In the past, such communications were handled by the sales sections of individual GM divisions.

Mr. Wiles also will function independently from the vice-president in charge of the distribution staff. He will operate from the corporation's headquarters in the General Motors Building in Detroit, and continue as a member of the Administration and Operations Policy Committee and as a GM director.

S-P Loses $29.7 Million In First-Year Operation

Studebaker - Packard's annual report shows the corporation lost nearly $30 million in 1955. Despite substantially higher automobile sales last year, S-P had a net loss of $29.7 million after tax credits, on sales totaling $480 million. Factory sales of cars and trucks totaled 201,067 units, compared with 146,776 the previous year.

Although the company sold more cars last year, the number was not sufficient to offset many non-recurring costs during the year following the merger of Packard and Studebaker. Operations were further hampered by slowdowns and stoppages in production, particularly at the South Bend, Ind. plant. Both divisions also lost substantial amounts as a result of cutbacks in their defense contracts.



BRITISH JET FIGHTER FOR CARRIER OPERATIONS

The British Vickers Supermarine N.113 swept-wing jet fighter is a development of the Supermarine 525. Designed for aircraft carrier operation, it is powered by two Rolls Royce Avon turbojet engines. Performance details have not been disclosed.

At the end of 1955, the company had working capital of $54.7 million and had borrowed $9.9 million against its $45 million line of bank credit. It borrowed a similar amount at the beginning of this year.

Although most of the merger costs have been absorbed and reductions have been made in manufacturing costs, the company does not expect to be in the black for the first quarter of 1956. Sales since the beginning of the year have been down drastically.

Combined Packard and Studebaker output for the first two months totaled approximately 29,000 units, compared with about 42,000 in the like two months last year. Packard output alone dropped from nearly 13,000 units last year to 4000 in the first two months of this year.

$15 Million Offered By Textron For Campbell, Wyant & Cannon

On April 19, shareholders of Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., will decide whether to sell the company to Textron American for a reported $15.5 million. The former would become a division of Textron American.

The Muskegon concern produces alloy iron and steel castings. Last year, it had an income of $1.73 million on sales totaling $34.6 million. The company has four plants in Michigan employing about 3500 persons.

Sweepstakes Award Captured By Imperial in Economy Run

Top honors in this year's annual Mobilgas Economy Run from Los Angeles, Calif., to Colorado Springs, Colo., went to an Imperial Southampton. The triumphal car was awarded first prize on the basis of 61.3796 ton-miles-per-gallon.

Winners in their respective price classes were as follows (first figure shows ton-miles-per-gallon, and second indicates actual miles per gallon):

Lightweight Class — Rambler De Luxe 6 (48.2218 and 24.3545); Low Price Class—Ford Customline Victoria 8 (47.7643 and 20.5217); Low Medium Price Class—Pontiac Chieftain Catalina (51.7297 and 21.1098); Medium Price Class—Oldsmobile 88 Holiday De Luxe (50.8077 and 19.7044); Upper Medium Price Class—Oldsmobile 98 Holiday De Luxe (50.9488 and 18.6694); and High Price Class—Imperial Southampton (61.3796 and 21.0420).

Average ton-miles-per-gallon for all cars was 48.6511, while average miles-per-gallon was 19.9536. Twenty-two American stock cars, all equipped with automatic transmissions, participated in the 1956 Economy Run.

Further details on the event, not available at presstime, will be published in a future issue of AUTOMOTIVE INDUSTRIES.

News of the AUTOMOTIVE

MACK TRUCK SHIFT UNIT

Unishift truck transmission with 10 forward speeds shifted by a single lever is now in production by Mack Trucks, Inc. A redesign and development of the Mack Mono-shift series, the new splitter-type unit will be offered in three different sizes for the entire range of highway trucks. Each of the three sizes offered is available with direct drive in the main gearset either in fourth or fifth. Where the direct drive is in fifth, 10 separate integrated ratios are afforded. In the overgeared version, nine such steps are provided.

Chevrolet Atlanta Unit To Expand 50 Per Cent

General Motors will expand its Chevrolet-Fisher Body assembly plant in Atlanta, Ga., by 50 per cent to approximately one million sq ft. Enlargement of the Chevrolet section will enable the plant to assemble convertibles and station wagon bodies for the first time. The Fisher section is expected to be completed late this year while the enlarged Chevrolet unit is scheduled to be ready in 1957.

GMAC Notes Down Payments On Cars Average 40 Per Cent

Contrary to opinions of some observers, who feel that automobile financing is being over-liberalized, is testimony presented by General Motors Acceptance Corp. before the Senate Subcommittee on Automobile Marketing Practices. While some finance companies admittedly are writing paper extending more than 30 months, GMAC noted that currently more than 80 per cent of its new car contracts have payment terms not exceeding 30 months. A similar percentage of its contracts have down payments of at least 30 per cent.

The GM finance company also says that its new car down payments are now averaging 40 per cent on the actual selling price. Terms are averaging 28 months.

There has been some disagreement as to the percentage of outstanding automobile credit which runs longer than 30 months. One recent study showed that a great proportion of the automobile credit is for longer than 30 months. GMAC, however, notes that less than 1½ per cent of the paper it wrote last year ran over 30 months. Those contracts carried down payments of less than 25 per cent. Of the one million cars financed by GMAC last year, only 14,312 fell into what the corporation terms "fringe" credit, or risk accounts.

Packard Planning to Test Out Public Reaction to Predictor

There are some hints that certain advanced styling features of the Packard Predictor "dream car" (see AI, Jan. 15, p. 35) may be adopted on the company's 1957 line of cars. To get wider public reaction to the car's engineering and styling concepts, the company will hold one-day showings of the car at more than 100 dealerships in major market areas.

Lindberg Industrial Corp. Buys Jet Combustion Firm

Lindberg Industrial Corp. has purchased the good will, drawings and other assets of Jet Combustion Co. of Chicago, Ill. The latter has specialized in rotary forge furnaces and other large steel mill heating equipment.

Lindberg Corp. designs and builds large industrial furnaces for melting and heat treating metals and for firing ceramics. Operations of both companies will be merged at the Lindberg plant in Chicago.

Sales of Station Wagons, Hardtops Hit Peak In '55

Considering the fact that most automobile companies did not introduce them until the latter part of last year, four-door hardtops registered impressive sales in 1955. According to AMA figures, there was approximately one four-door hardtop sold for every three two-door hardtops. The former accounted for approximately 6 1/3 per cent of the total new cars sold last year.

Factory sales of both types of hardtops soared to 2,168,798 units last year. This figure was more than double that of 1954, to account for over 27 per cent of the total car sales in 1955.

Sales of station wagons last year climbed to a record 759,422 units to represent more than 9½ per cent of the total market. In 1947, station wagons accounted for only 2.3 per cent of total sales.

Sedans took nearly 60 per cent of the market last year. Two-door models dropped to third spot with sales totaling 1,677,430 units, slightly above 21 per cent of the market. Four-door sedans took more than 38 per cent of the total with sales topping three million units.

Business coupes also continued to lose ground. Factory sales last year totaled 13,408 units, against 16,510 in 1954. They accounted for only 0.17 per cent of total sales in representing the smallest share of all types of body styles. Convertible sales climbed to 239,790 units from 155,667 in 1954 to account for about three per cent of total sales.

SUPER-SIZE SHAKER

Latest addition to the North American Aviation Environmental Laboratory is this powerful vibration exciter. It is shown testing here an electronic device in a simulated airframe mounting. The system weighs nine tons, can subject test equipment items for supersonic aircraft and guided missiles to 45 g, and has a continuous rated force of output of 12,500 lb.

DuPont Sales, Earnings Hit New Heights in 1955

Sales and earnings of the Du Pont Co. set new records in 1955 as a result of additional manufacturing capacities coupled with increased demand for the company's products.

Sales were at a new high of $1.909 billion, 13 per cent above 1954 and nine per cent over the previous high of $1.750 billion in 1953. Total earnings came to $432 million, compared with $344 million in 1954.

Chrysler Gas Turbine Engine Tested on Cross-Country Run

Chrysler Corp. is actively testing an experimental gas-turbine-powered passenger car on an endurance run of 3000 miles from New York to Los Angeles. The test car (a 1956 Plymouth sedan) was scheduled at press-time to leave New York on March 26 with two teams of alternate drivers.

Objective of the test is to obtain technical data on the durability and performance of various important components of the Chrysler gas turbine engine under actual traffic and climatic conditions.

AI TABLOID

Kaiser Aluminum & Chemical Corp. has developed a new method of producing gold-colored aluminum.

* * *

Lotus Engineering Co., Ltd., will start production shortly of a new and lighter car model to be known as the Lotus Eleven.

* * *

Vertol Aircraft Corp. has been adopted by shareholders as the new name for Piasecki Helicopter Corp. . . . Trundle Engineering Co. has changed its name to Trundle Consultants, Inc.

* * *

Firestone Tire & Rubber Co. has introduced an improved tubeless tire made with nylon.

* * *

Ford Motor Co. of Canada, Ltd., is expanding its line of trucks to include a series of models with a new ohv six-cylinder engine. The new six-cylinder power plant may become available in some passenger cars as well.

* * *

Watkins-Dunn Co., Inc., is name of new concern formed to manufacture motor truck bodies in Buffalo, N. Y.

* * *

Youngstown Sheet & Tube Co. plans a million-ton boost in its annual capacity. . . . Climax Molybdenum Co. will double its pure molybdic oxide capacity.

* * *

Du Pont Co. will build a paint plant in Valencia, Venezuela.

* * *

Los Angeles attendance at the 1956 General Motors Motorama reached a record 573,000 persons.

* * *

American-Marietta Co. is moving to acquire Presstite Engineering Co. . . . Link Aviation, Inc., has purchased a controlling interest in Air Trainers, Ltd.

Kenworth Motor Truck Co. is now producing an electrically-powered earthmover truck for underground hauling.

* * *

Detroit Steel Corp. has announced plans to spend $20 million on capital improvements at its Portsmouth Works, O., this year and in 1957.

* * *

General Electric Research Laboratory has set up a new European office at Pelikanstrasse 37, Zurich 1, Switzerland.

* * *

Ross Carrier Div. of Clark Equipment Co. has introduced a new fully hydraulic 30,000-lb straddle carrier. . . . LeTourneau-Westinghouse Co. has announced a new 18 cu yd Model C Fullpak scraper.

* * *

American Transit Association has formed a special new bus design committee.

* * *

Bell Aircraft Corp. disclosed that it has built 1700 helicopters since its first commercial unit was certified by the Government ten years ago.

* * *

Martin Co. has announced that successful test firings have been made with a new version of the Martin Matador tactical missile known as the TM-61B.

* * *

May has been designated as National Vehicle Safety-Check month.

* * *

Narmo Mfg. Co. is now fabricating high-temperature jet aircraft ducting of reinforced glass fibers.

* * *

Copco Steel & Engineering Co. is beginning output of a new line of aluminum trailers.

(*Turn to page 98, please*)

News of the AUTOMOTIVE

CHEVROLET HOLDS LEAD IN HIKING MARKET PERCENTAGE

1956 New Car Registrations*

Arranged by Makes in Descending Order According to the 1955 Totals

MAKE	January 1956	December 1955	January 1955	Per Cent of Total January 1956	Per Cent of Total January 1955
Chevrolet	109,342	162,989	77,810	25.33	17.67
Ford	85,775	144,526	89,814	19.87	20.41
Buick	44,803	59,331	50,588	10.38	11.50
Plymouth	36,945	50,329	47,364	8.56	10.76
Oldsmobile	36,525	51,566	39,893	8.46	9.07
Pontiac	28,721	43,293	36,614	6.65	8.32
Mercury	19,700	29,802	21,249	4.56	4.83
Dodge	15,501	20,707	20,651	3.59	4.69
Cadillac	11,472	15,354	12,530	2.66	2.85
Chrysler	9,096	12,973	13,347	2.11	3.03
De Soto	7,496	10,175	8,963	1.74	2.04
Studebaker	7,000	7,085	6,640	1.62	1.51
Nash	5,527	5,971	4,645	1.28	1.06
Lincoln	2,942	4,068	2,179	.68	.50
Packard	2,833	3,971	1,690	.66	.38
Hudson	2,583	2,658	2,494	.60	.57
Continental	210	277		.05	
Miscellaneous Domestic	104	269	1,003	.02	.23
Foreign	5,073	5,144	2,550	1.18	.58
Total—All Makes	431,648	630,488	440,024	100.00	100.00

* Based on data from R. L. Polk & Co.

First-Quarter Car Output Is Second Best Ever

Ending the second best first quarter on record, after a slow start at the beginning of the year, automobile manufacturers foresee a brightening picture for second-quarter production. Now that record inventories are showing a downward trend as a result of the spring upsurge in new car sales, most plants are back on a five-day operation.

First quarter output was surprisingly good, considering the sharp cutbacks that were made by nearly every company at the outset of the year. There were more than 1.7 million cars built in the first three months, about 18 per cent fewer than the record 2.1 million in the like quarter last year.

If the industry produces the same number of cars in the second quarter as it did in the first quarter, the April-June period will also be the second best on record. It will be topped only by last year's 2.1 million units.

Chevrolet reported that its vehicle sales for January and February climbed to an all-time high of 309,338 units from 267,642 last year, up approximately 15 per cent. The big gain resulted largely from high truck production which has been on the increase by all makers this year.

Chevrolet car production was down with the rest of the industry. From the beginning of January through the end of February, Chevrolet turned out approximately 319,000 cars, compared with about 338,000 in the same period last year.

Further indication of the upward trend in sales since the latter part of February is provided by a report from Chrysler Corp. which shows that total February sales were up 14 per cent above January. The closing 10 days of February at Chrysler Div. saw sales soar 60 per cent above the preceding 10 days.

Another interesting note is that Cadillac's total February sales topped the record 13,319 units set in February of 1955 by 27 units. Lincoln broke its previous February record with retail deliveries of 3775 cars, about 54 per cent above last year.

Except for the Rambler, production by the independents was down slightly, with Packard the hardest hit. Combined output of the independents during the first two months approximated 58,000 units, compared with 68,000 at the same time last year.

1956 RETAIL CAR SALES BY PRICE GROUPS*

Number of Sales

Price Group	January 1956 Units†	January 1956 % of Total	January 1955 Units†	January 1955 % of Total
Under $2,000	75,405	17.68	220,677	50.46
$2,001 to $2,500	235,466	55.21	142,622	32.61
$2,501 to $3,500	95,987	22.51	58,058	13.27
Over $3,500	19,614	4.60	16,013	3.66
Total	426,472	100.00	437,370	100.00

Dollar Volume of Sales*

Price Group	January 1956 Dollars	January 1956 % of Total	January 1955 Dollars	January 1955 % of Total
Under $2,000	$145,941,485	14.60	$419,736,496	42.68
$2,001 to $2,500	504,235,260	50.45	332,525,799	33.82
$2,501 to $3,500	267,603,462	26.77	165,470,308	16.83
Over $3,500	81,714,192	8.18	65,577,065	6.67
Total	$999,494,399	100.00	$983,309,668	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four-door sedan or equivalent model. Does not include transportation charges or extra equipment.
†—New registrations of American made cars only. Does not include imported foreign cars.

Scott-Atwater Is Acquired By McCulloch Motors Corp.

McCulloch Motors Corp. has further diversified its business by the acquisition of Scott-Atwater Manufacturing Co. The latter, a producer of outboard engines, will operate as a wholly-owned subsidiary of McCulloch.

Combined sales of the two companies are expected to reach $50 million a year. In addition to automotive superchargers, McCulloch makes power chain saws, power lawn mowers, drone aircraft engines, and other engine products.

AND AVIATION INDUSTRIES

Packard-Clipper Offers Brake Fluid Reservoir

Packard - Clipper Div. is making available a brake fluid reservoir as a dealer-installed accessory. Carrying a suggested list price of $6.95, excluding installation and fluid, the glass unit mounts on the firewall underneath the hood and is connected to the brake master cylinder by means of copper tubing. Fluid is fed into the brake system as needed, and visual inspection of the fluid level is permitted at all times. The unit holds eight oz of brake fluid.

AMC, Studebaker Offer Free Accident Insurance

With spring come new aggressive merchandising programs by car makers to attract more customers into dealer showrooms. Seeking to boost their shares of the automobile market, American Motors and Studebaker last month (March) started offering free accident insurance to car buyers.

AMC provides $12,500 coverage for the purchaser and a similar amount for the spouse in the event either dies in an accident while driving an AMC car (or $25,000 if both die). Studebaker's policy provides $20,000 in coverage for the registered owner, but does not include the spouse.

In the case of joint ownership of car, such as husband and wife, a clause is written into the policy indicating whom is to be insured. Both policies remain in effect for one year after date of purchase.

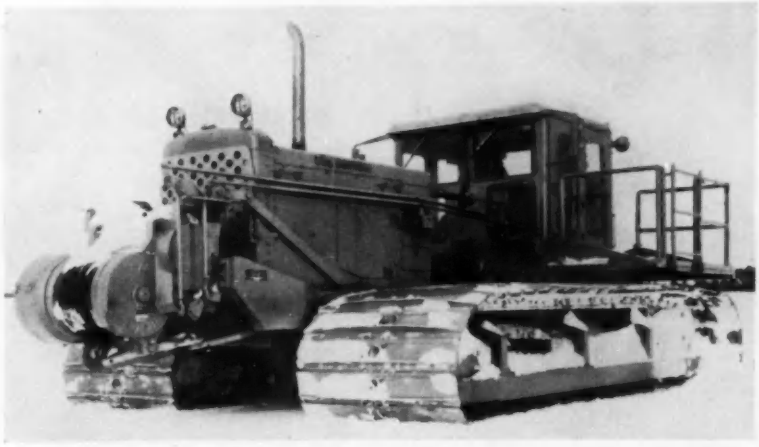
De Luxe Automobile Speedway Planned for Los Angeles Area

The Los Angeles area will shortly have a multi-million dollar automobile speedway. A combine known as the Los Angeles International Raceway has announced plans for a four-year, $12 million project.

By mid-1956, the organization expects to complete on a 470-acre site at Ontario, Calif., six race and test tracks (5½-mile and 4½-mile road courses; one-mile and ½-mile oval tracks; three-mile speed test course; and a drag strip). These tracks will handle European Grand Prix sports car and stock car races, while Indianapolis racers can use the one-mile oval. The three-mile testing circuit is designed for use by stock car manufacturers.

The speedway will feature: safety controls for drivers and spectators; electronic race timing, scoring, signaling devices; a parts and accessory supply house; closed circuit television; and a paved area for 22,000 cars.

(*Turn to page 98, please*)



LOW GROUND PRESSURE TRACTOR FOR TOUGH TERRAIN

Special low ground pressure (3.4 psi) tractor has been developed by the Corps of Engineers' Research and Development Laboratories and is being produced by Peterson Tractor & Equipment Co. for Arctic use. Powered by a six-cylinder, 225-hp Diesel engine, it is equipped with an extended frame which provides a track 160 in. long on the ground and has track shoes 54 in. wide. Smaller version of the tractor, powered by a 195-hp Diesel engine, has also been developed.

1956 TRUCK SALES GET OFF TO GOOD START IN JANUARY

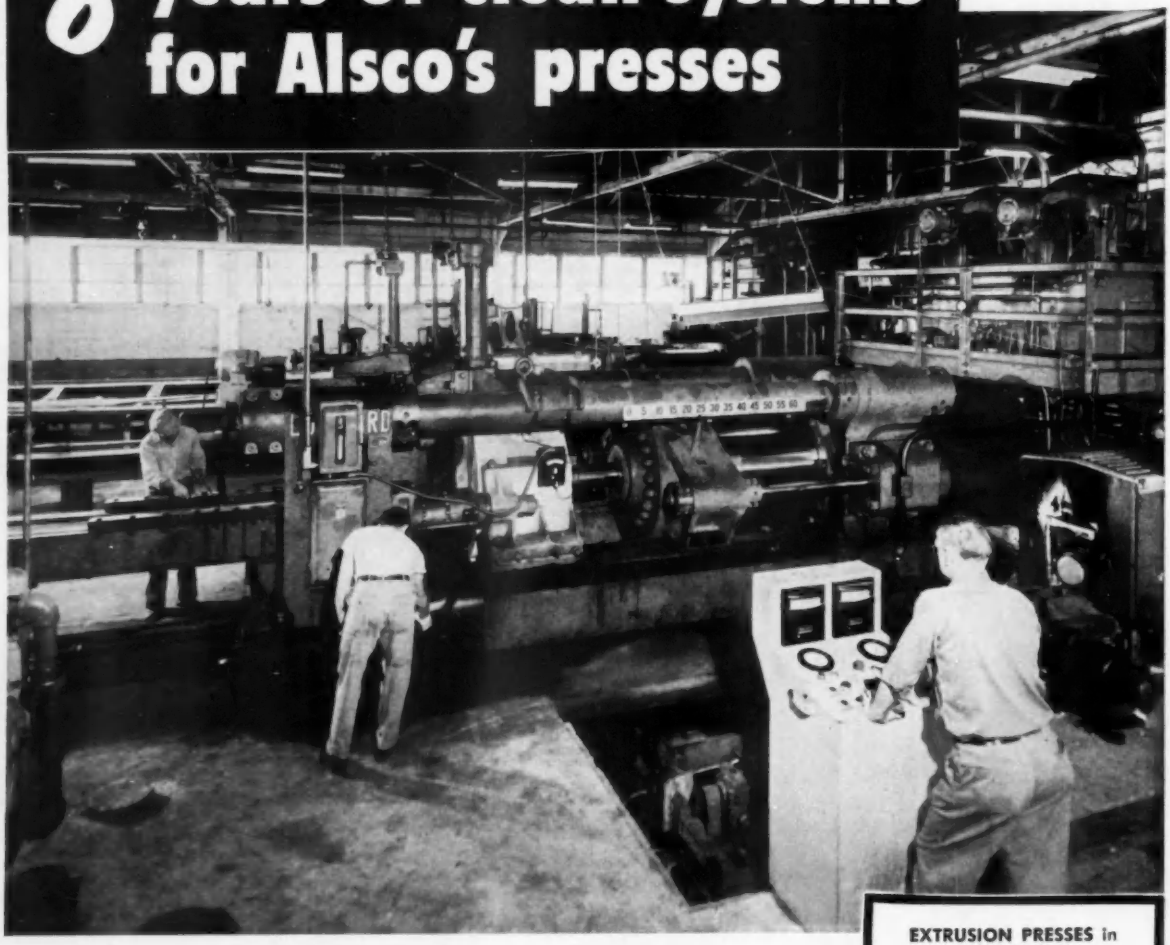
1956 New Truck Registrations*

Arranged by Makes in Descending Order According to the 1956 Totals

MAKE	January 1956	December 1955	January 1955	Per Cent of Total: January 1956	Per Cent of Total: January 1955
Chevrolet	22,286	34,701	19,437	33.70	31.22
Ford	19,044	28,380	18,792	28.80	30.20
International	8,108	7,581	8,396	12.26	13.49
G. M. C.	6,872	9,873	5,161	10.39	8.29
Dodge	4,140	5,405	5,287	6.26	8.50
White	1,251	1,299	1,023	1.89	1.64
Mack	959	1,101	541	1.45	.87
Willys Truck	881	1,789	1,197	1.30	1.92
Studebaker	849	801	750	1.28	1.21
Willys Jeep	450	1,212	642	.68	1.03
Diamond T	318	344	221	.48	.36
Reo	218	286	213	.33	.34
Divco	203	232	247	.31	.40
Kenworth	108	47	91	.16	.15
Brockway	75	134	97	.11	.16
F. W. D.	41	63	19	.06	.03
Peterbilt	38	14	23	.06	.04
Miscellaneous Domestic	95	109	46	.14	.07
Foreign	225	362	48	.34	.08
Total—All Makes	66,141	93,733	62,231	100.00	100.00

* Based on data from R. L. Polk & Co.

8 years of clean systems for Alsco's presses



EXTRUSION PRESSES in the Gnadenhutten plant of Alsco, Inc., Akron, Ohio. Pressures range from 1,100 to 2,000 tons. Operating temperatures are normally 140° F. — may go as high as 160°F. In addition, there are ten smaller pumps actuating the stretchers. All this equipment has used *Texaco Regal Oil R&O* for eight years with outstanding results.

ALSCO, INC., Akron, Ohio, has used *Texaco Regal Oil R&O* as its sole hydraulic fluid for the past eight years. During this period, the hydraulic systems in four heavy duty extrusion presses have remained completely free of rust, sludge and foam.

Alsco's experience with *Texaco Regal Oil R&O* reflects the merit of this superior oil. Tests prove that *Texaco Regal Oil R&O* has *more than ten times the oxidation resistance* of ordinary turbine-quality oils. This means proven ability to prevent rust, sludge and foam. The result is extended life for pumps and other vital parts, lower maintenance costs.

There is a complete line of *Texaco Regal Oils R&O* to meet the requirements of every type and size hydraulic mechanism, under every operating condition. A Texaco Lubrication Engineer will help you select the one exactly suited to your equipment. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

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The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS

TUNE IN: TEXACO STAR THEATER starring JIMMY DURANTE on TV Sat. nights. METROPOLITAN OPERA radio broadcasts Sat. afternoons.

Men in the News

Buick Motor Div., General Motors Corp. —Edward T. Ragsdale has been appointed general manager.

Gemmer Manufacturing Co.—**E. D. Graham** has been appointed manager of manufacturing.

Chrysler Corp., Export Div.—**K. E. Thompson** is now sales manager.

Bohn Aluminum & Brass Corp. — **Richard C. Aylward** was named general sales manager.

Mather Spring Co. — **Harry C. Daugh** has been appointed chief industrial engineer.

Chrysler Corp., Forge and Foundry Div. — **James G. Barnes** was named comptroller; **Roderick M. Menoch,** manager of manufacturing services; **Charles S. Keller,** manager of forward planning; **Robert B. Boswell,** divisional chief engineer; and **Samuel P. Elliott,** manager of industrial relations.

Cadillac Motor Car Div., General Motors Corp.—**Richard J. Milliman** has been appointed product improvement engineer.

Eclipse Machine Div., Bendix Aviation Corp.—**A. L. Thompson** has been made sales manager; **R. K. Gornall,** assistant sales manager for Stromberg carburetors; and **C. L. Mellor, Jr.,** sales manager for Bendix starter drives.

Pratt & Whitney Co., Inc.—**Louis Reiss** has been named treasurer and controller.

Borg-Warner Corp. — **Andrew B. Pulliam** has been appointed director of manufacturing services.

Dewey and Almy Chemical Co. — **George W. Blackwood** has been elected president, and **William L. Taggart, Jr.,** has been elected executive vice-president.

Planet Corp., Conveyor Div.—**Warren J. Zeis** has become chief engineer.

Thompson Products, Inc., Replacement Div.—**Robert N. Black** is now manager of export service sales.

Jones & Lamson Machine Co. — **John E. Barbier** has been appointed manager of engineering, and **W. F. Couts** has been named manager of the Thread Tool Div.

Threadwell Tape & Die Co.—**Roy H. Heldenbrand** has been named manager.

Firestone Tire & Rubber Co.—**Fred L. Hooper** has been appointed director of tire production planning and distribution.

Eaton Manufacturing Co., Heater Div. — **H. Charles Simons** has been promoted to sales manager.

Dodge Div., Chrysler Corp. — Jack W. Minor was named general sales manager for passenger cars and trucks.

Ford Motor Co., Tractor and Implement Div. — Edgar H. Woods has been appointed general sales manager.

Kearney & Trecker Corp., Aircraft Machine Tool Div.—**W. E. Brainard** has been made chief engineer.

General Electric Co. — **Cramer W. LaPierre** has been elected an executive vice-president, and **Charles R. Pritchard** has been elected a vice-president.

Arma Div., American Bosch Arma Corp.—**Alan F. Thompson** has been appointed vice-president of manufacturing.

Anchor Steel & Conveyor Co. — **Francis I. LeVeque** has been named a vice-president; **Marshall I. Brenner,** a vice-president; and **Cameron O. Schooley,** assistant secretary.

United Aircraft Products, Inc. — **James P. Malmstrom** has been appointed general manager.

Howe Scale Co., Truck Div.—**Jack Brandt** has been made sales manager.

Baker Brothers, Inc. —Roland Lehr has been appointed president and general manager.

Harvey Aluminum Co. — **Harrison A. Price** has been chosen director of commercial development.

Hanson-Van Winkle-Munning Co.— **Myron B. Diggin** has been made vice-president and a director.

Buick Motor Div., General Motors Corp.—**Jesse L. Powers** has been named general manufacturing manager; **Donald F. Taylor,** assistant general manufacturing manager; and **Joseph J. Schweinfurt,** general superintendent of all plants.

(*Turn to page* 98, *please*)

Necrology

John M. Sylvester, 65, general manager of the main plant of Bethlehem Steel Co., died Feb. 28, at Bethlehem, Pa.

Guerin Todd, Sr., 60, head engineer of Hanson-Van Winkle-Munning Co., died recently, at Matawan, N. J.

Howard A. Coffin, 79, former controller of the old Warren Motor Car Co. and one-time assistant to the president of Cadillac Motor Div. of General Motors Corp., died Feb. 28, at Washington, D. C.

Fred H. Mohler, 61, factory representative for Inland Manufacturing Div. of General Motors Corp., died March 7, at Dayton, O.

G. C. Westervelt, 75, aviation pioneer, died March 15, at Stuart, Fla.

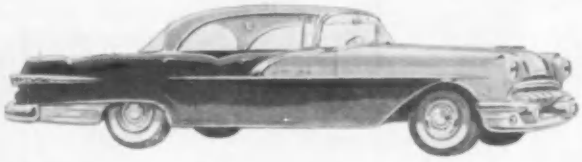
Alonzo G. Decker, 72, chairman and president of Black & Decker Mfg. Co., died March 18, at Towson, Md.

WHY PONTIAC SWITCHED SHELL-CAST CRANKSHAFTS

For many years automotive engineers have sought to produce a successful *cast crankshaft*. But either the material or the method of casting did not give the desired results. Now, however, Central Foundry Division has solved both problems by means of their tough pearlitic malleable iron, ARMASTEEL, and their perfected shell molding process. Pontiac Motor Division is the first of the great automobile manufacturers to capitalize on the advantages of the new ARMASTEEL crankshafts. After conducting a long and exhaustive series of tests in the laboratory and on the road, Pontiac is now installing shell-cast ArmaSteel crankshafts in all 1956 models.

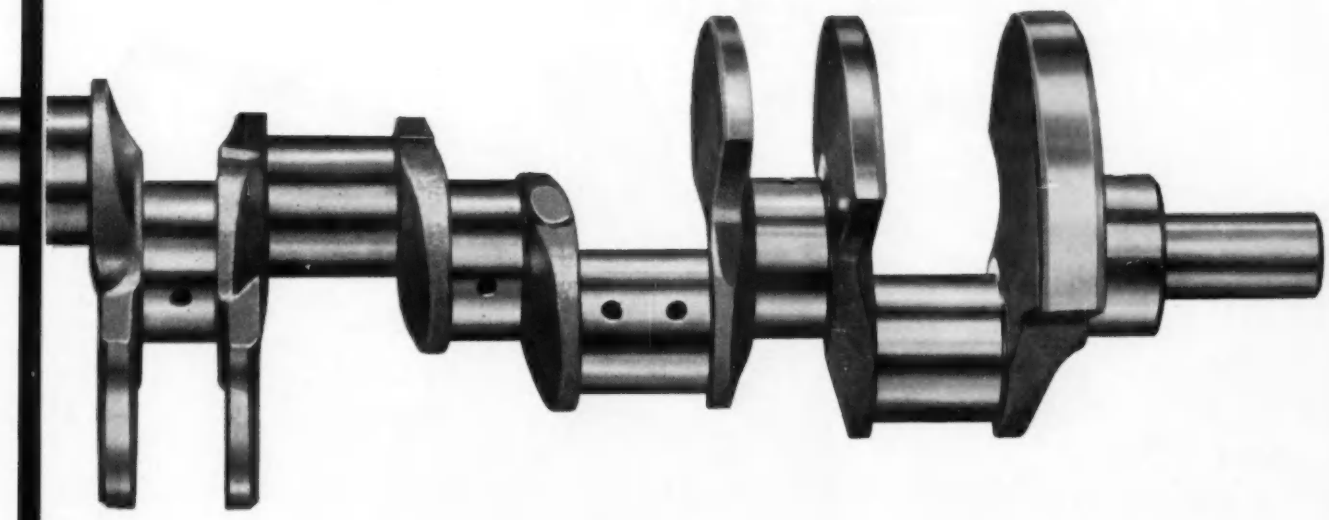
ARMASTEEL, the metal, is a triumph of modern metallurgy that combines the advantages of both castings and forgings. Its resistance to fatigue and wear assures long life. Its rigidity results in minimum deflection and accurate alignment. Its high damping capacity allows it to absorb vibrant energy and thus contribute to noiseless operation.

The crankshaft, made by the shell-mold process at Central Foundry, results in substantial manufacturing savings. Because the castings are so close to the final finished dimensions, shell-cast ArmaSteel crankshafts are lighter and require considerably less machining and finishing.



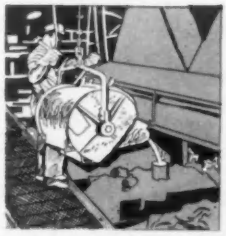
Many manufactured products can be improved and the costs lowered with shell-cast ARMASTEEL. If you are a manufacturer, engineer, production man or purchasing director, it will pay you to write us today for your copy of the book "ARMASTEEL" and the pamphlet "Shell Molding at Central Foundry".

TO ARMASTEEL



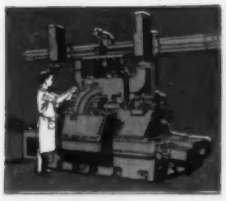
BETTER MATERIALS, BETTER METHODS, LESS MACHINING AND THOROUGH TESTING MEANS BETTER CRANKSHAFTS FOR PONTIAC

SHELL MOLDING allows metal to be poured exactly where it is needed. Tolerances can be so close that finishing can be reduced and, in some areas, eliminated. The shell mold gives the engineer considerably greater latitude in design.



ARMASTEEL is a pearlitic malleable iron with characteristics of low carbon steels produced only at Central Foundry Division of General Motors Corporation. Its machinability is rated 33⅓% better than SAE 1045 steel. It is uniform in structure, possesses excellent bearing qualities, responds readily to localized hardening, and is a material of exceptional rigidity.

MODERN TESTING techniques in the new shell-cast ARMASTEEL crankshafts include gamma-ray radiography, 100% magnetic particle inspection and sonic testing (a Central Foundry development) on each individual crankshaft.



LESS MACHINING and finishing is required with shell-cast ARMASTEEL crankshafts. Rack-to-rack lathe cycle time on in-line diameters, for example, was cut in half! Cutter and grinding wheel life is increased in all machining operations.

CENTRAL FOUNDRY DIVISION · GENERAL MOTORS CORPORATION

CENTRAL FOUNDRY DIVISION

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64

Model 6120 Lucas Precision Horizontal Boring, Drilling and Milling Machine.

"the machine that can do anything"

Extreme accuracy, feather-touch pendant control, automatic power positioning for repetitive work make a Lucas the most useful machine in any shop. There's a model and size for *your* horizontal boring, drilling and milling operations. Lucas Machine Division. The New Britain Machine Company, 12302 Kirby Avenue, Cleveland 8, Ohio.

A complete range of models, built in 3″, 4″ and 5″ spindle sizes with mechanical controls and in 4″, 5″ and 6″ sizes with electrical controls. Wide variety of table and saddle sizes with two or four-way beds optional.

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OF
CLEVELAND

A DIVISION OF
THE NEW BRITAIN MACHINE COMPANY

ORTMAN-MILLER

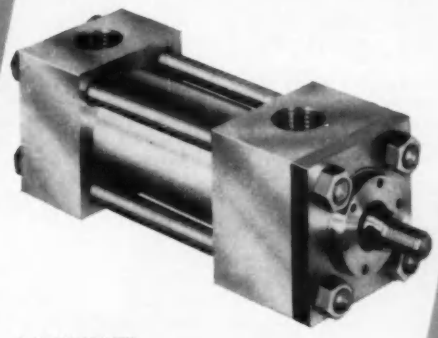
Cylinders

- *Air and Hydraulic*
- *Meet JIC Standards*

O-M Tie-Rodless (air-hydraulic) with compact space-saving design, due to O-M Special Interlocking Mechanism, eliminates bulk . . . saves up to ⅓ installation space. Interlocking feature also makes it easy to orient ports, disassemble, inspect, clean, repair, assemble, thus reducing maintenance.

Available in complete range of sizes (1½" to 8" bores), with standard 2 to 1 or oversize rods. All steel construction with bearing bronze. Completely interchangeable parts and mounts, described in Bulletin 101A.

O-M TIE-RODLESS
Air to 500 psi
Hydraulic to 1500 psi



O-M SERIES TH
Hydraulic 2000 psi

O-M Series TH (heavy duty hydraulic) rated at 2000 psi—features heavy walled seamless steel tubing, microhoned for minimum friction, and rolled steel heads accurately machined and recessed to confine the tube, prevent breathing and to provide additional protection against leakage under most severe usage. Hard chrome plated piston rods. A multiple lip self-compensating rod gland packing, contained in a removable cylinder, facilitates replacement without disassembling cylinder.

Available from 1½" to 8" bores described in Bulletin 105.

Engineering Service—

Consult an Ortman-Miller representative regarding your pneumatic and hydraulic problems. His broad experience with standard and special cylinder applications is available to you without cost or obligation. Use convenient coupon for name and address of O-M representative nearest you.

Mail coupon today for Bulletins 101A and 105

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☐ Send Bulletins 101A and 105

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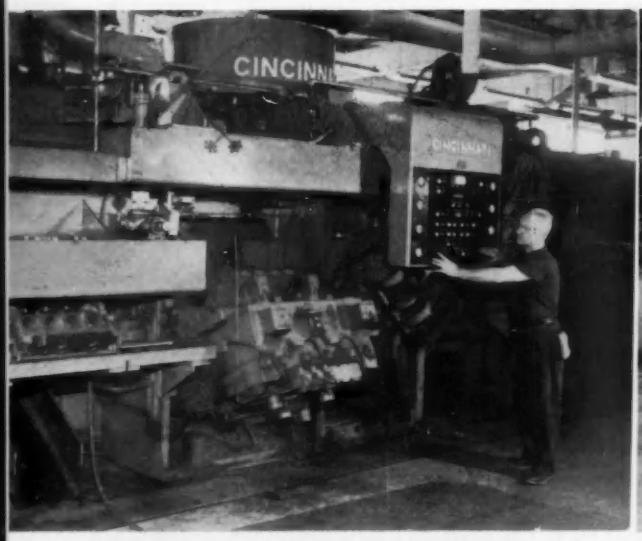
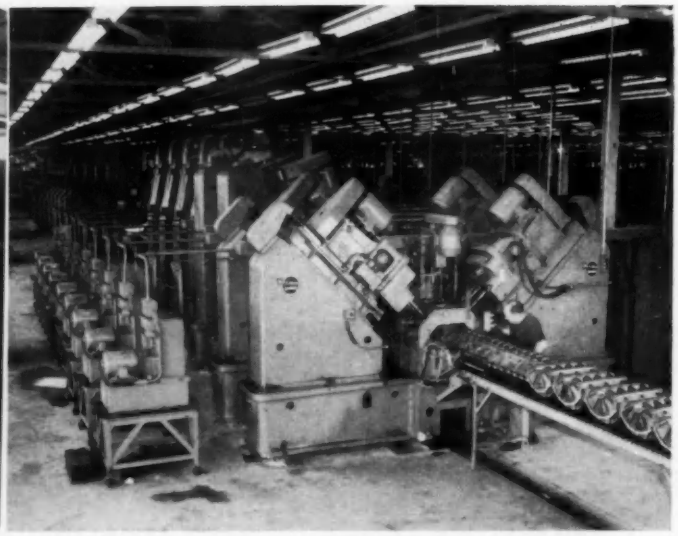
Chrysler's Canadian Engine Plant

By
Joseph Geschelin



Partial view of the horizontal type Cincinnati surface broaching machine for cylinder blocks. A similar, three-station machine is installed on the cylinder head line. At the right is a perspective view of W. F. & John Barnes transfer machine on the cylinder block line. It is composed of two transfer machines—10-station, and 19-station—tied together by automation links. This machine performs a variety of drilling operations, including drilling of Welch plug holes, oil lines, main bearing holes, oil pan holes, and oil filter base holes.



ONE of the major advances made by Chrysler Corp. of Canada, Windsor, Ontario, was the completion late last year of an extensive engine plant program, providing new facilities for manufacturing V-8 engines at the rate of 45 an hour. Although this level of production does not justify automation to the extent that it has been applied in some of the newer plants in the Detroit area, it is noteworthy that this engine plant boasts machine tools of the most advanced type and includes some examples of very large automatic transfer machines.

Looking at the cylinder block line, one is impressed with the modernity of the setup. The first operation is surface broaching in the same type of horizontal Cincinnati broaching machine used in the U. S. A. There is a large W. F. & John Barnes transfer machine installation on this line, mainly for detail drilling and associated operations. This unit is actually composed of two individual transfer machines—one having 10 stations, the other 19 stations—tied together by automation conveyor links.

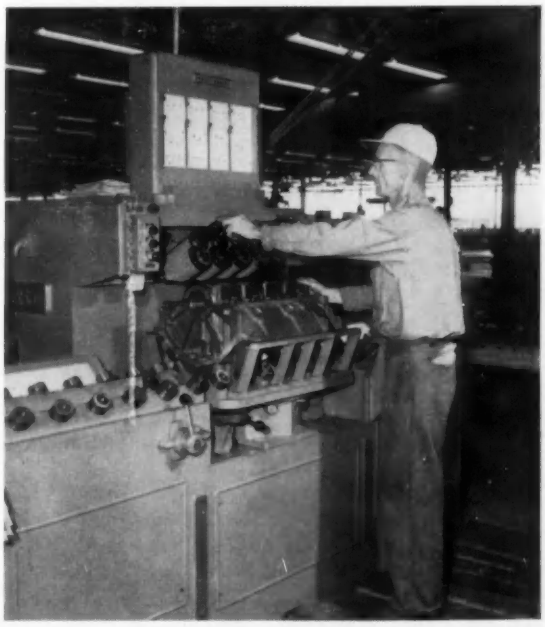
Near the end of the block line there is a seven-station W. F. & John Barnes transfer machine for boring the cam and crank lines.

Cylinder boring is done meticulously, rough-boring in Ingersoll machines, semi-finish-boring and precision-boring in Ex-Cell-O boring machines, honing in one stage in Barnesdril V-type honing machines. Total tolerance on bore size is held to 0.0005 in. Bores are gaged and graded in the Sheffield Pricisionaire inspection machine illustrated here. Pistons are selectively fitted in the bores, using five grades for the purpose.

The cylinder head, despite its complication of machining operations, is completed essentially in just two machines. The first stage is the familiar horizontal Cincinnati surface broaching machine of three station type, of the same size and make as is found in Detroit area plants. The rest of the operations—drilling, reaming, tapping, boring, valve facing, etc., etc., associated with cylinder head machining—is done in an enormous W. F. & John Barnes transfer machine.

In reality this transfer machine is an integration of four independent transfer machines tied together by

Many Machines Similar to Those Used in the United States Are Found in the New Facilities of Chrysler Corp. for Manufacturing V-8 Engines



Cylinder bores are gaged and graded in five steps in this Sheffield Precisionaire machine which handles four bores at a time.

means of automation links to provide a continuous cycle. The first machine has 26 stations; the second, 17 stations; the third, 23 stations; the fourth, 11 stations.

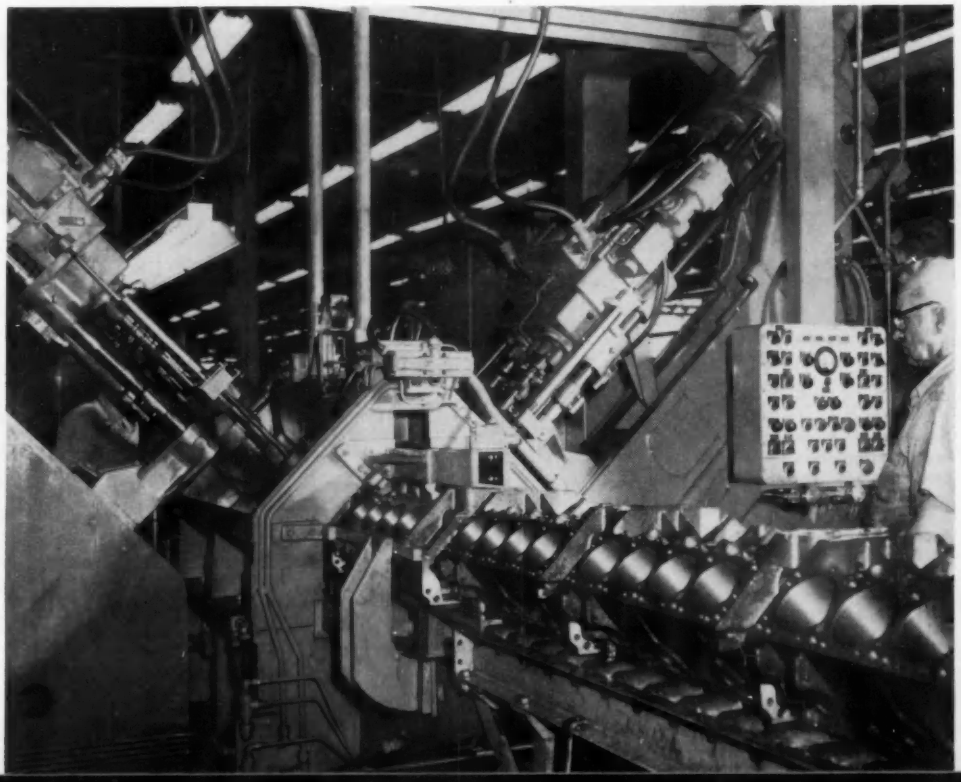
Perhaps the most distinctive feature of the W. F. & John Barnes transfer machines is the installation of the Electro-Graphic Detecto-Boards on each unit. It marks an unusually impressive array, probably one of the largest single installations we have noted to date.

Another symbol of modernity is the adoption of the familiar Cross Toolometer boards, serving practically every large machine tool in this plant.

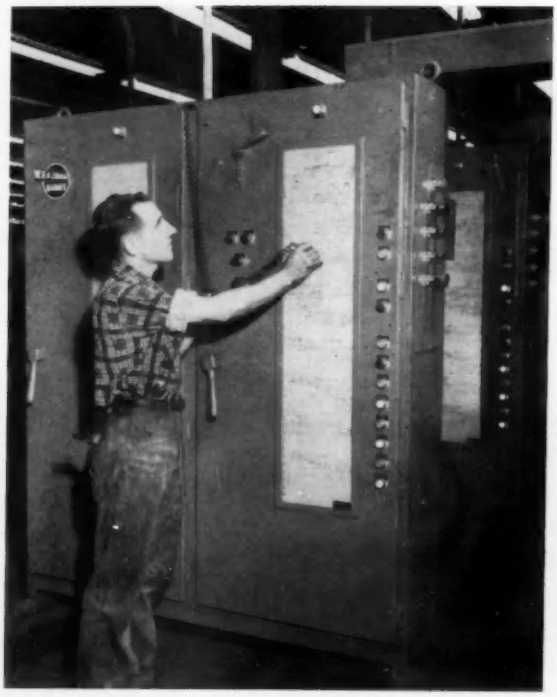
Crankshaft turning is done in a battery of LeBlond lathes of latest type. It was noticeable that this department could not justify automation and as a result the LeBlond lathes are not fitted with automatic loading and unloading mechanism. Crankshafts are balanced twice before assembly—once directly after machining, and again after assembly with the flywheel. Dynamic balancing is done in the latest type electronic Tinius Olsen balancers, holding crankshafts to a tolerance of 0.25-oz in. The crankshaft and flywheel assembly, in turn, is held to a tolerance of 0.50-oz in.

By maintaining such close control of balance on all rotating and reciprocating parts, including pistons and connecting rods, Chrysler of Canada does not find it necessary to balance the engine as an assembly.

On the camshaft, the distributor drive gear is cut



Cylinder bore honing, following precision boring in Ex-Cel-O equipment, is done in Barnesdril V-type honing machines with automatic cycle. Total tolerance on bore size is held to 0.0005 in.



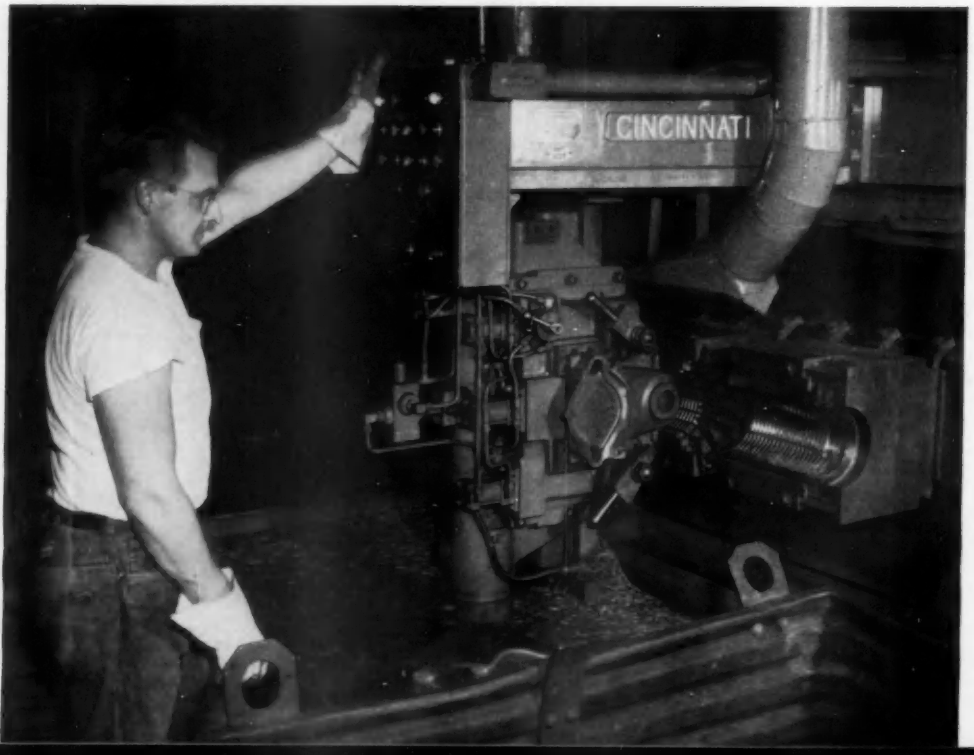
In addition to the W. F. & John Barnes transfer machine on the cylinder block line, an even larger installation was supplied by this company for the cylinder head line. This machine is an integration of four transfer machines—26-station, 17-station, 23-station, and 11-station. Noteworthy feature of these transfer machines is the adoption of Electro-Graphic Detecto-Boards to provide a positive and quick means of locating trouble in the electrical wiring system at any point.

in single-spindle, vertical Cleveland Rigidhobbers, then shaved in Michigan Tool circular cutter gear shaving machines.

As illustrated, engines are assembled on individual pedestals which move with the floor conveyor along the lengthy engine assembly line. At the end of the line engines are routed directly to a large battery of special Nankervis test stands which operate on an automatic cycle.

There has been so much discussion recently regarding the design of transfer machines as well as forward planning to provide for adequate flexibility that it seems pertinent to note that Chrysler of Canada has spanned a considerable stretch of advanced practice in the equipment now in operation. For example, there has been discussion of what may be termed segmented automation as one major principle. This is a basic feature of the transfer machines on the V-8 engine line. Each of the machines, as noted earlier, is composed of two or more independent sections tied together by automation links which can be readily disengaged.

What appears to be even more advanced practice is that each transfer machine section is composed of relatively small machine bases or modules, consisting in some instances of two working stations and two idle stations. Some may be even smaller than this, perhaps one working station and one idle station. In any event, a section consisting of a large number of stations is actually an integration of a large number of small machines tied together on a common base.



Interesting example of an intricate surface broaching operation is the broaching of the half-round seal surface on the timing chain case cover. The operation is performed in a special Cincinnati broaching machine.

Portion of engine final assembly line to show the pedestal type fixtures on which engines are built up. Crankshafts are installed at the station in the foreground.

Engines are given a final test run in automatic cycle Nankervis stands seen here. They are run through an established test cycle, subjected to various set test loads.

Any normal changes in product design can be readily accommodated simply by adding or removing some of the existing heads. Similarly, if a break-down occurs anywhere along the line, it is a simple matter to short circuit the affected section and continue operating the other sections.

It appears that Chrysler of Canada has bridged a gap in progress extending some years into the future.

As a matter of general interest it may be noted that the portable tools used in engine production are a mixture of air tools and high cycle tools, depending upon the particular application.

Most of the machine tools, and all transfer and automation equipment are actuated hydraulically.

• • •

Strick Truck-Trailer Plant To be Built in Phila. Area

Strick Trailers, a division of Fruehauf Trailer Co., will build a new 200,000 sq ft truck-trailer manufacturing plant in the Philadelphia area during 1956. Construction of the new facility, which is expected to employ approximately 1000 persons, is expected to start by early summer.

The decision to build the new plant was said to have been prompted by Strick's rapidly increasing truck-trailer business. It was reported that Strick sales during the first two months of 1956 were more than double the sales in 1955's first two months.

Strick's volume of business is said to be one of the principal elements in Fruehauf's expected sales of well over $400 million for 1956. Fruehauf sales during 1955 totaled $234,611,908, and net earnings reached $8,658,045.

Fruehauf acquired the manufacturing facilities of the Strick Co. and Strick Plastics Corp. in January this year. Acquired assets included a leased manufacturing plant in Philadelphia, a leased plant at Trevose, Pa., just outside of Philadelphia, a plant in Chicago, and a plastics plant at Perkasie, Pa.

U. S., British Producers Agreed On Joint Standards for Engines

American and British airframe builders may be invited by the U. S. Government to confer on joint standards for their products. This is seen as a definite possibility in the light of new agreement by the two countries on certification of aircraft turbine engines.

Builders of turbine engines here and in Britain now know what tests their products must pass to be accepted for purchase without restriction in both countries. Prior to the agreement reached in Washington recently by aviation officials, U. S. and British standards were nominally the same. However, each nation imposed special conditions on certifications and complicated the job of getting full acceptance of engines.

While the rules applying to U. S. civil aircraft work will have to be changed now, manufacturers can begin testing under the new rules. In no case, says the Civil Aeronautics Administration, will test standards be lower than those in effect previously.

One problem worked out during the sessions was that of rating engines for thrust. Under the U. S. system, ratings for a group of engines were figured downward from the most efficient engine, which was given a 100 per cent rating.

The British rated their engines upward from the bottom of the "scatter," causing complaints here that the British engines were overrated. Both countries will use U. S. system.

Both also are agreed on a single method of determining engine weight. A jet engine will be weighed with all parts needed to run it, plus the oil that is in the system. Weight of reservoir oil will not be included.

Army Ordnance Reveals

New Engine Development Program

Small, Lightweight Vehicles Needed for Future Military Operations. Current Design Problems Analyzed at Annual SAE Passenger Car Meeting in Detroit

BY JAMES R. CUSTER

ARMY Ordnance has adopted a program to develop new engines to power small, lightweight vehicles. Details were announced at a special session during the annual National Passenger Car, Body and Materials Meeting held March 6-8 in Detroit by the Society of Automotive Engineers.

Military planning back of this program was outlined by Brigadier General N. M. Lynde, Jr., Commanding General of the Ordnance Tank Automotive Command at Detroit. Carl F. Bachle, Vice President —Research, Continental Aviation and Engineering Corp., was chairman of the meeting.

Technical phases of the new engine program were presented by Captain Richard H. Sawyer of the Detroit Arsenal. A summary of his talk follows:

There has been a change in the concept of military vehicle design. Emphasis will be upon speed and lightness. A big proportion of future military vehicles will be of the air-transportable size, wheeled and tracked, which will serve transport and fighting functions. As troop carriers, they should be just large enough to transport the smallest infantry unit —the squad. For fighting, they will be lightly armored and powered for speed and agility.

Army Ordnance has established the power range for the new engines at 20 to 160 hp. Needed are small, lightweight engines with high specific power output. High speed engines and flash ratings will be accepted, which is an abandonment of the long standing conservative policy of requiring engines with long life, low piston speeds, and power ratings over extended periods.

Ordnance engineers plan to examine both piston engine and gas turbine designs. Under consideration are low pressure turbines with regeneration, and high pressure turbines. In the piston type they favor the two-stroke design and supercharging. Two families are proposed, one with a small bore and an output of 10 hp per cylinder and the other with a large bore and 20 hp output per cylinder. Small bore engines would have a range of 20 to 80 hp, large bore engines 80 to 160 hp.

Other design considerations are compression ratios compatible with 90/100 octane gasoline to be available by 1960, engine speeds of approximately 6000 rpm for four-stroke and 4000 rpm for two-stroke cycles, fuel injection to reduce size and improve fuel economy, miniaturization of electrical systems, and possible use of dry sump lubrication system.

A wide range of current problems in passenger car design were featured at the other technical sessions during the three days. Among the principal subjects were brakes, automatic transmissions, piston and gas turbine engines, car noises, high-speed tires, and body trim materials.

The new Bendix disk-shoe brake, Budd disk brake and the new Studebaker flared cross-rib drum were described at the symposium on new developments in passenger car brakes.

Discussing seals for passenger car automatic transmissions, R. C. Grasby of the Chicago Rawhide Manufacturing Co. advocated that research be directed to ascertain the effects of improved oils under development on packing materials.

William G. Mertens and Frank Zuzich of the Detroit Transmission Div., General Motors, presented the results of a comprehensive survey on automatic transmission gear steels, including their chemical and physical specifications and heat treatment.

What is being done to develop tires for high speeds and increasing tire loads was reviewed by M. P. Hershey of the Firestone Tire and Rubber Co. He pointed out that to obtain the best high speed tire performance, a tire as large as is practical should be used.

S. L. Terry, Chrysler Corp., in his paper, stated that the method of trimming the roof is probably the oldest type of assembly used in the industry, yet efforts to develop simpler and less expensive roof linings have so far proved unsuccessful. He forecast drastic changes in the installation methods, one of which is the molding of a headlining in one piece and installing it as a unit.

Earth satellites will be built and will have successful commercial applications, it was predicted by Prof. S. L. Singer of the University of Maryland. To date about $20 million have been spent in their development.

Extracts from some of the outstanding technical papers are presented herewith.

Combining the Features of Disk and Shoe Brakes

By T. H. Thomas
Mgr. of Automotive Eng.
Bendix Products Div., Bendix Aviation Corp.

FIG. 1 illustrates the new automobile brake design which we call the Disk-Servo. The brake drum is similar to the enclosed disk type in that the flat-end surfaces are friction surfaces. In addition, like the shoe-type brake the cylindrical surface is also a friction surface. Two friction pads expand outward to bear against the flat end-surfaces of the drum. An arc shaped shoe, similar to those used in present shoe-brakes, moves outward to bear against the inside cyclindrical surface of the drum. The principle of the action is this: A hydraulic cylinder is placed so as to force the two pads outward against the drum. This action is self-energizing through a ball-and-ramp mechanism which also tends to spread or force the pads outward against the drum. The spreading action of course involves a certain amount of movement of the pads as they tend to be carried around with the drum. So far, we have a self-energizing enclosed type disk brake.

A linkage connects the pads with the shoe. As the pads move around slightly with the drum, the motion is transmitted through the linkage so as to move the shoe into contact with the drum. Following that, the force of the friction between the pads and drum is transmitted through the linkage servo action to press the shoe against the drum. The work of braking is about equally divided between the pads and the brake drum surface.

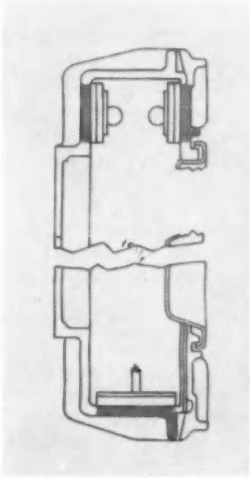


FIG. 1

Disk-Servo brake with three rubbing surfaces

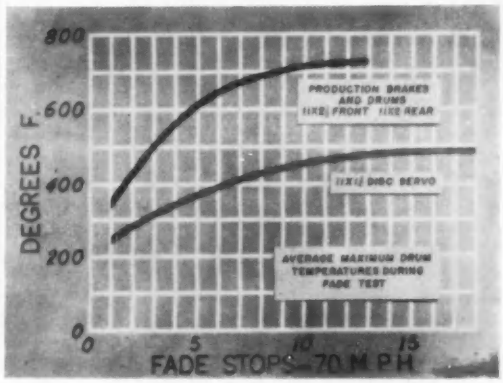


FIG. 2

Brake temperatures

The stationary friction units—pads and shoes—are small compared to the large swept area of the drum. We have the cooling advantages of the spot disk construction, plus the advantage of three swept surfaces instead of two. We have the self-enclosed feature of the enclosed disk. And we have the self-energizing feature and other advantages of the well-proved, highly developed shoe type brake, but with an inherent improvement in stability resulting from the fact that the serving elements (the pads) do not operate against the same friction surface that is used by the element which they serve (the shoe).

The curve in Fig. 2 has been prepared by averaging data taken by means of thermocouples located in brake drums and housings, at a distance of 0.090 in. from the rubbing surface in each case. They show that, when conventional 11-in. brakes are used, the temperatures obtained during excessive stops from 70 mph at one mile intervals rise, until they begin to level off at about the 12th stop at a little over 700 F. When the same type of test is conducted in the same car under identical conditions, but with Disk-Servo brakes instead of conventional shoe brakes, the temperatures tend to level off at about the 17th or 18th stop at approximately 500 F. There is therefore a difference of slightly more than 200 F between the temperatures obtained under identical conditions with the two types of brakes. This, of course, contributes quite a bit to the fade resistance of the brake, which is exceptionally good, and also to the ability of relatively small segments of brake lining to stand up for surprising periods of time.

Studebaker's New Flared, Cross-Rib Drum Brake

By W. B. Love and D. E. Hobson
Studebaker-Packard Corp.

MANY automotive engineers have felt that an increase in brake performance and fade resistance, above that which can be obtained with conventional brake and drum design, is needed to keep pace with the increasing performance of modern cars. A simple, relatively inexpensive, and easily applied solution to this problem is the "Safety-Fin" brake drum being used on the higher performing Studebaker models for 1956.

The new drum, developed and supplied to Studebaker by the Budd Company (see AI, Oct. 15, 1955, page 57), can best be described as a flared, cross-rib brake drum. It is a composite drum with a cast iron drum ring and a steel back. A flared extension is added to the conventional rib at the mouth or seal edge of the drum. The flare protrudes over the brake backing plate to contact the air stream underneath the car and to direct this air stream across the drum. The flare also provides a better, sling type seal. Additional drum surface area is obtained by uniform cross ribs cast on the outside diameter of the drum. These cross ribs blend into the flare for strength and also to provide better heat conduction from the braking surface to the flare.

The brake to which this drum is applied is a self-centering, self-energizing brake which has been used by Studebaker since 1954. As is gener-

ally known, this brake differs from the normal fixed anchor self-energizing brake in that the shoes are free to move up or down on the anchor. The shoes can therefore adjust themselves to gain full secondary lining contact with drum expansion or lining wear.

The flared, cross-rib drum has consistently produced cold performance superior to standard drums in addition to its better heat dissipating characteristics. The reasons for this improvement in performance are difficult to establish, although it is probably related in some way to drum deflection. In high speed, high rate stops, it is possibly caused by lower drum and lining braking surface temperatures in the latter part of a stop.

Fig. 1 is a plot of front brake drum temperatures measured by button thermocouples contacting the braking surface during a series of 10 stops from 55 mph at one-minute intervals and 10 ft/sec² deceleration. Temperature readings were taken 15 seconds and 45 seconds after each stop. After the 10th stop, the differential temperature of drum to air was about 44 per cent greater for a standard drum than for the flared cross-rib drum.

Fig. 2 is a plot showing the improvement in brake fade performance provided by the flared cross-rib drum. Two identical cars were equipped with new brake linings. One car was tested with standard drums and the other with the new flared cross-rib drums. The linings were burnished and the standard Studebaker fade test was conducted. The fade cycle plotted in Fig. 2 is the most severe of a series of fade cycles used in the test. It represents approximately the most extreme usage that a car equipped with standard drums can be subjected to without resulting in permanent damage to the linings.

The cycle consists of 12 stops from 60 mph at 45-second intervals (approximately one 60 mph stop each ¾ mile). Brake line pressure is varied from stop to stop to maintain, as nearly as possible, a 400-ft stopping distance. The performance factor used in plotting is a measure of deceleration, in ft/sec², obtained for each pound of pedal force applied by the driver.

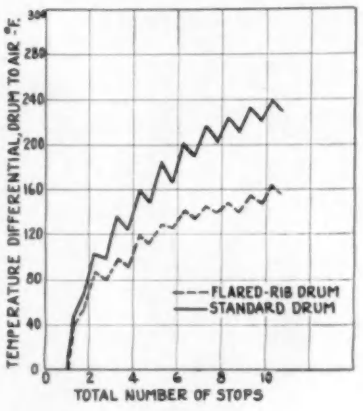


FIG. 1

Drum temperatures, braking

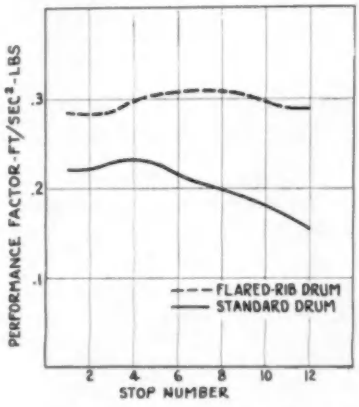


FIG. 2

Fade test comparison

The curves show that on the 12th stop, the performance of the car equipped with the flared, cross-rib drum is still above its initial performance. The car is still making normal stops with only a small loss in performance from the peak performance reached.

With the standard drums, performance increases slightly until about the fourth stop. From this point on fade occurs rapidly. At about the eighth stop the brakes have faded seriously. There is a delay after pressure is applied before the brakes start to become effective at the start of each stop. Pulls and dives occur which are erratic and unpredictable as the brakes start to become effective. A definite fade-out at the ends of the stops occurs. Extended fade tests of the flared cross-rib drum show it to be capable of at least twice this number of fade stops without an appreciable loss in performance, erratic behaviour, or damage to the linings.

Several factors are involved in getting this increase in performance and cooling. The major factors are drum mass, drum surface area, and air flow over the drum. Considerable work has been done by Budd to establish the amount of improvement provided by the flare and the amount provided by the fins. One of their tests on drums similar to the new Studebaker drum showed 8 per cent reduction in drum temperature was provided by drums with the flare alone, 17 per cent by drums with the ribs alone, and 53 per cent by the combination of the flare and ribs, disregarding the relative masses of the drums. These tests show a surprising improvement for the combination when compared with the total of the improvement for the two factors measured separately.

Fade and Stability of Automotive Brakes

By J. W. Kinchin

Director and Chief Engineer, Girling Ltd., England

MUCH interest is being displayed at present in disk brakes and all manufacturers are seeking a satisfactory solution to the disk brake problems. My own company has been involved on the development of disk brakes for some time and has experienced a considerable amount of success with these brakes in racing. We also have the first passenger carrying bus in the world to go in production with these brakes; this is operating very satisfactorily and the lining life is better than that experienced with drum brakes.

It is interesting to compare the characteristics of the disk brake with those of the two trailing shoe brake. The two trailing shoe brake from the fade and stability point of view is the best drum brake produced and, therefore, it is not worth while comparing the disk brake with any other design. The brake factor of the two trailing shoe brake for a co-efficient of friction of 0.38 is 0.59 and let us assume a pedal effort of 100 lb. If the co-efficient of friction falls to 0.25 the brake factor becomes 0.45, i.e., 24 per cent change and the pedal effort would rise to 131 lb; the percentage change of pedal effort is therefore 31. Under the same conditions the two leading shoe brake factor changes from 1.75 to 0.98, i.e.,

44 per cent and the pedal effort rises to 179 lb, i.e., 79 per cent increase. The servo brake has a still greater change.

The disk brake has no servo factor but is a Girling construction using a hydraulic cylinder applying a pad on each side of the disk.

It would seem from the theoretical figures that a fade resistance comparable with the fade resistance of the disk brake can be achieved on the two trailing shoe design. The disk brake is superior from the point of view of smoothness because there is no change in the shape of the disk, whereas the brake drum shape changes when being subjected to shoe pressures at high temperatures, and of course the disk brake does not expand away from the linings as is the case of the shoe brake. On the contrary the disk expands towards the linings.

Comparison of the figures for horsepower absorption for the disk and drum brakes is interesting. For the disk brake we employ a segmental lining and use a horsepower absorption figure of 6.5 to 7.5 per sq in. of lining. The horsepower dissipation for the disk is 0.65-0.75 per sq in. Thus while the lining loading has gone up by approximately three times as compared with the drum brake the dissipation rate has been almost halved per sq in. of swept area of disk compared with the drum.

Although based on these figures it will be seen that the lining area of the disk brake has been reduced in the ratio of 3 to 1 the total volume of lining available for wear on the disk brake exceeds that of the comparable drum brake by some 10 to 15 per cent due to the fact that the whole of the lining volume can be worn away, while on the drum brakes the ends of the lining arc are usually left thicker than the middle portion of the arc.

Finally I would like to sound a note of warning regarding the ability of the disk brake to rescue designers from the difficulty of the small wheel. The disk brake, in order to give satisfactory life, must be chosen of adequate size and in its present state of development offers no universal panacea for space problems.

Some Elements of Gas Turbine Performance

By S. D. Heron, Consulting Engineer

Part-Load Performance

In the great majority of potential applications of the gas turbine to road vehicle use it would appear that the most important question is that of part-load thermal efficiency. In the majority of cases the specific fuel consumption of gas turbines is quoted at full load and it is considered impolite to inquire as to the specific consumption at part load. It is usually considered to be even more impolite to inquire as to the gallons per hour consumed at idle. In the case of a passenger car developing 200 hp at the wide open condition, but spending much of its operating life at an engine output of about 10 hp or less, these impolite questions have to be asked.

The piston engine appears offhand to have a considerable advantage over the gas turbine in respect to part-load fuel economy, since the compression ratio of the piston engine is independent of engine speed and engine output, whereas the pressure ratio of the vehicle type turbine varies with engine output. In vehicle practice this advantage of the piston engine is to some extent more theoretical than real, since while the compression ratio remains constant, the fuel economy cannot remain constant in practice due to the bugbear of engine friction. For maximum fuel economy the piston engine (at least the gasoline type) must be operated at nearly full throttle with power output varied by means of engine speed. Even with a magic transmission that would produce such a mode of operation, it is difficult to visualize a 200 hp gasoline engine which will operate at 5 hp (approximately 20 mph for a passenger car) and nearly full throttle. In practice, the lack of the magic transmission and the necessity for part throttle operation (with resultant marked increase of engine friction) results in the 200 hp engine usually having a thermal efficiency of the order of 10 per cent to 13 per cent at 5 hp, instead of the 25 plus per cent which could be obtained at full throttle.

In the gas turbine where engine power output is varied by means of engine speed (and of course by variation of turbine inlet temperature), the pressure ratio varies simultaneously with engine speed. This variation of pressure ratio can be either an advantage or a disadvantage. In a turbine with a high efficiency regenerator and currently attainable compressor and turbine efficiencies, reduction of pressure ratio with reduced turbine inlet temperature is still more advantageous than it is with the non-regenerative turbine. Thus the characteristic variation of pressure ratio with turbine inlet temperature is, with a high efficiency regenerator, a happy combination for a turbine unit required to operate extensively at low load factors.

Fuel Consumption at Idle

The fuel consumption at idle can have a marked effect upon the average fuel mileage of a road vehicle turbine. As far as is known there are no published data for idling fuel consumption of vehicles equipped with turbines. If idling fuel consumption is to be judged by that of non-regenerative, single-shaft turbo-props and industrial turbines, the prospect is not encouraging. In such turbines the idling rpm may be as high as 90 per cent of the rpm at rated power and the fuel gallonage one-third of that at rated power. Turbo-jets may idle at as low as 25 per cent of rated rpm, and may use less than 15 per cent of the fuel gallonage required at rated power.

In the vehicle turbine, the idling problem is distinctly different to that of the aircraft turbine and that of many industrial types. The use of a regenerator promises to very markedly reduce idling fuel consumption. Low idling rpm will be desirable to produce smooth performance at very low road speeds in a passenger car. However, even low idle rpm will not avoid unwanted power at low road speeds, when the turbine is fitted with a regenerator and has just slowed down from full power operation. This excess power due to stored heat in the regenerator will prevent the idle rpm from being reduced to its normal value. Several methods for eliminating this unwanted power are apparent. One simple one is a bypass valve between the compressor turbine and the free turbine. This waste gate would bypass the gas from the compressor turbine through the regenerator and thus would partly conserve the heat in the turbine exhaust. This waste gate could also be used to eliminate creep when the vehicle is stationary. Without such a waste gate or another measure producing a similar result, high idle rpm is likely to be very objectionable in respect to creep.

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Friction Materials for Automatic Transmissions

By J. F. Johnson and E. P. Stefi
Raybestos-Manhattan, Inc.

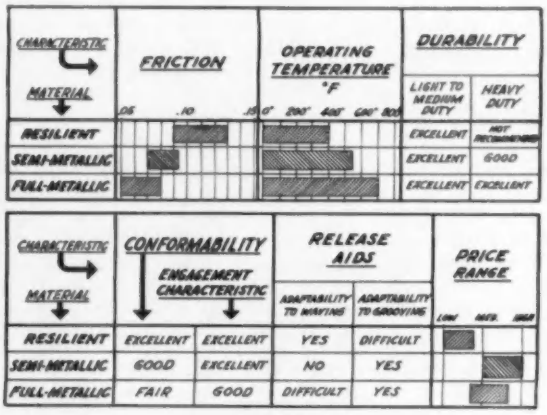

FIG. 1

Characteristics of resilient, semi-metallic and full-metallic material

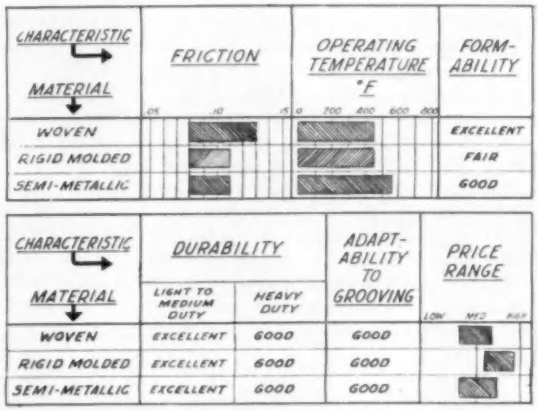

FIG. 2

Characteristics of woven, rigid molded and semi-metallic material

SPECIFIC application for the various types of friction materials can be subdivided into two general classifications—Plates and Bands. The first of these to be considered will be Plates.

In the resilient class, the combination of cork-cellulose material in the dual faced rings is used in the Chrysler Powerflite, General Motors Hydra-Matic and Powerglide, and Packard Ultramatic is by far the most extensively used. Despite the limitations of resilient materials with respect to temperatures and pressures, many thousands of specifically designed units have been built and are operating satisfactorily. Priced at the lowest cost of any of the oil usage materials it is doing an excellent job.

Semi-metallic plates are the second in usage and are found in the Buick Dynaflow and the Ford front clutch. When bonded to steel and correctly grooved, excellent engagement and release characteristics and long life are obtained.

The most prominent use of sintered metal plates in automatic transmissions is found in the rear clutch of the Ford line. The durability and cost of these materials for such an application has great merit. A brief summary of the data on the foregoing materials as applied to plate applications is illustrated in Fig. 1.

In band application three types of friction material are principally used.

The flexibility of the woven asbestos friction material makes it suitable for double rap applications such as found in the front band of the General Motors Hydra-Matic. The single wrap front band of the Ford line also utilizes this type of material. The ease of assembly together with the high friction and excellent durability make woven products well suited to band applications.

The rigid molded material is generally supplied for band application in segment form. This material is used on the rear band of the General Motors Hydra-Matic and the ends of the front band of the Ford line. The great resistance to high unit pressures is the outstanding feature of rigid molded for such applications.

Semi-metallic material is used on the Buick bands, Ford rear band, both Chevrolet bands and the Chrysler low band. Excellent engagement characteristics and durability have given wide usage to this type of material.

The comparative properties of these groups of materials are illustrated in Fig. 2.

New American Motors V-8 Engine

By John F. Adamson, Carl E. Burke and David V. Potter
Automotive Research and Eng. Dept. American Motors Corp.

FIG. 1 shows the full throttle gross performance curves of the new American Motors' engine (see AI, March 15, page 285). These curves are based on dynamometer results obtained with best power fuel and spark advance, an 8.0 to 1 compression ratio, and corrected to standard SAE conditions.

As can be noted in Fig. 1, the peak horsepower of 190 is obtained at an engine speed of 4900 rpm. The friction horsepower curve shows the results of the relatively short stroke design and weight reduction in moving parts, in that it reaches a value of only 34 horsepower at 4000 rpm.

The specific fuel consumption curve contains the results of attention to

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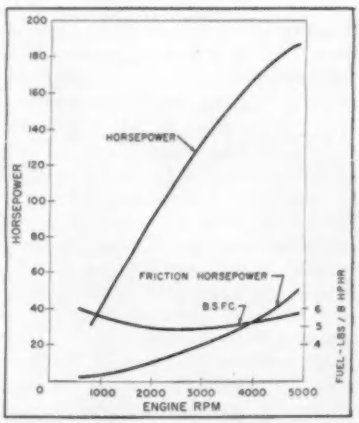
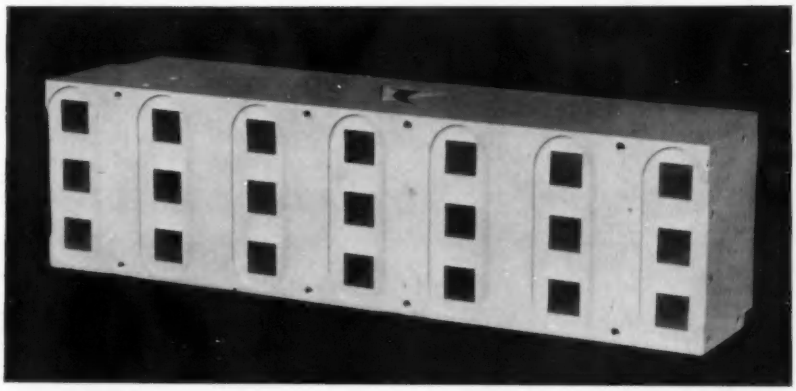


FIG. 1

Full Throttle Performance



Finished epoxy resin optical device is vapor coated with aluminum giving a mirror finish to the optically smooth surfaces of the part.

Molding EPOXY RESINS *for* Accurately Finished Parts

A NEW technique in molding epoxy resins, which imparts optical finishes and precision to extremely complex finished products has been developed by Northrop Aircraft. The process was developed when Northrop production engineers were offered a contract to produce a number of optical testing devices for the U. S. Navy.

Original concept had been to electroform each individual segment of the complex device and then assemble them into the desired configuration. This would have been an extremely costly method since all surfaces and dimensions were required to be optically precise.

Northrop research and development men virtually reversed this concept and made a segmented mold which was then assembled to the required precision. The mold itself cost approximately as much as one part would have cost under the original concept.

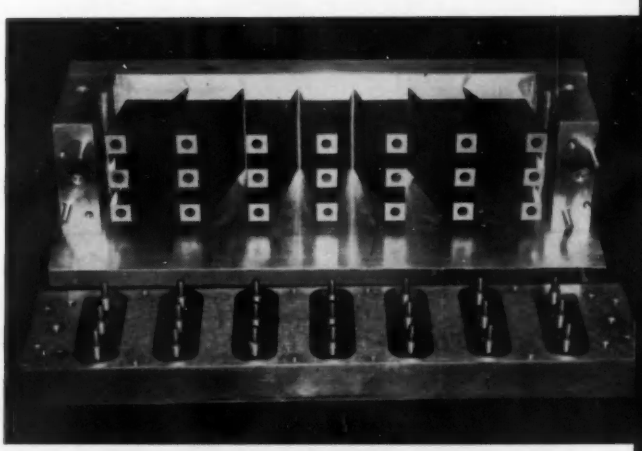
The process consists of slush molding all surfaces of the master mold, which is then placed in a vacuum chamber to expand the resin and remove all air bubbles.

The mold is then filled with resin and inexpensive glass marbles. Low cost of the marbles is not the prime consideration, however, since they reduce the chemical heat caused by the catalyst in the resin and prevent shrinkage of the part itself during the curing period.

Threads for mounting the part are cast into the mold by extending screws into the resin. These are backed out after the resin has solidified, leaving an accurately cast thread.

Lack of shrinkage, because of insertion of the marbles and other additives, results in dimensional accuracy within a tolerance of 0.0015 in. All surfaces are optically flat and either radii or "knife edge" corners are reproduced faithfully by the new process.

The finished parts of the Navy testing device are vapor coated with aluminum giving all orifices a reflective finish.



Complex master mold devised by Northrop research and development engineers for use in molding epoxy resin parts is lapped to a mirror finish. The "knife edges" shown on the mandrils are reproduced faithfully and to overall dimensional tolerances of 0.0015 in. Hundreds of extremely complex parts may be made by a new usage of epoxy resins developed at Northrop from such a mold.

• • •

British Engines to Be Built In India Under License Deal

Automobile Products of India (API) has entered into an agreement with the British firm of Henry Meadows under which it will produce the latter's full line of engines for the Indian market under license. Henry Meadows is a subsidiary of Associated British Engineering, Ltd.

During the initial stages of the agreement, complete engines will be shipped from Britain. These will be followed by "knocked-down" engines, and it is expected that eventually complete units will be turned out in Indian plants.

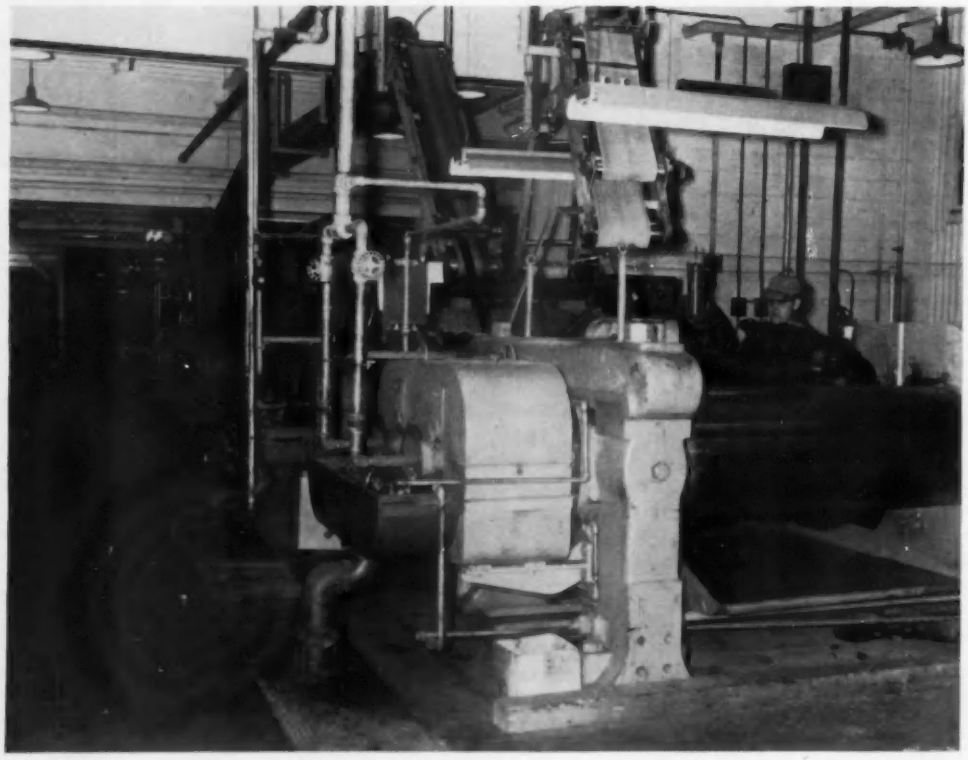
Automotive Rubber Bushings

Turned Out with Electronically-Controlled Equipment

SELECTIVE automation is a key part of the setup at the Milan, Ohio, plant of Harris Products Co. With the increasing use of rubber-and-metal parts in automobiles, particularly in front and rear suspensions, new methods have been developed to hold quality standards while meeting the higher demands.

At the Milan plant, one important operation is the pressing of extruded rubber tubing under high pressure between concentrically positioned large and small bushings. For best performance characteristics, the finished rubber-and-metal product must contain a precisely controlled amount of rubber. Because the length of each rubber section was always the same, and density or consistency of the rubber uniformly maintained, only tube diameter variations could produce changes in the amount of rubber to each mold. Therefore, the conveyor speed is a critical factor in the entire operation because extrusion of a slightly varying amount of rubber onto a constant speed conveyor would cause an uneven diameter of tubing. Precisely controlled conveyor speed provides the required regulation for production of the precision mountings.

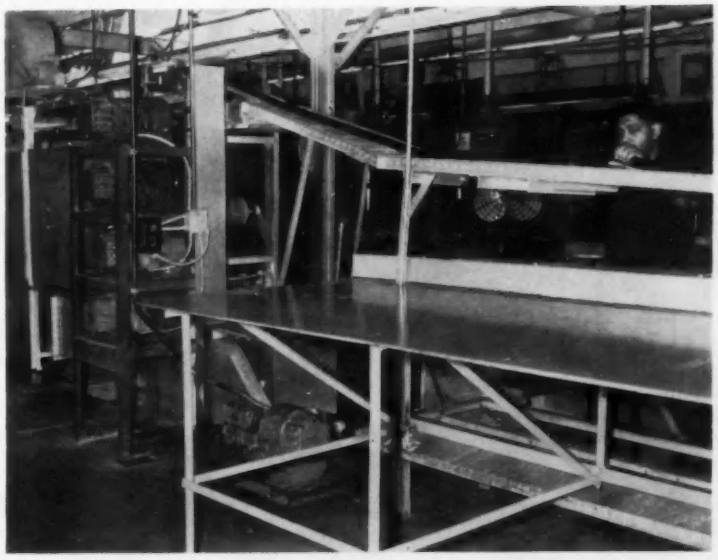
Production flow is initiated when sheets of rubber are fed into a rubber breakdown mill and the resulting rubber is then passed by an overhead conveying system to a warm-up mill. From here, the resulting warm strip rubber passes by overhead conveyor down into the extruder for extrusion into hollow tubing or solid tubing, or other cross-sectional shapes as desired. The extruder is driven by a 75 hp electronic adjustable-speed Reliance V*S Xatron drive. Precise control of speed is one of the outstanding features of the drive. The extruded rubber passes immediately onto a weighing conveyor driven by a Reliance V*S Jr. Adjustable-Speed drive. Over a length of approximately eight feet, the rubber is weighed for a



Rubber breakdown and warmup mills side-by-side where production flow begins. Rubber passes between mills by overhead conveyor and then by overhead conveyor to the extruder

By M. H. Phelps
Application Engineer
Reliance Electric & Engineering Co.

Extruder (right) from which the extruded rubber passes onto weighing conveyor (center) and on into water cooling bath (left).



*Four Reliance V*S Jr. gear motors stacked on different levels drive the water cooling conveyor. Rubber passes from cooling toward the right and is rough cut into long lengths before precise guillotine cutting.*

required weight per linear foot. Changes in linear weight are reflected as movements in the pointer arm, and then as predetermined limits are exceeded, the master speed potentiometer is activated by the operator. This creates an electric signal calling for the conveyor drive motor to speed up or slow down to maintain the diameter of the extruded tube within prescribed limits. The scale is preset before each run so that zero error should be indicated on the scale during the run. Anything other than an indicated zero error means that the required weight is not being produced.

The rubber then passes into a water-cooling bath and makes four passes looping back and forth on four different levels. As changes in speeds occur on the primary conveyor, corresponding changes are provided on the conveyors that follow and the same electronic signal adjusts their speeds. A second modification is necessitated by the shrinkage of rubber during cooling. By means of dancer rolls used in connection with the four Reliance VSS units (one for each conveyor), changes in speed are easily accomplished. The VSS is a speed-setting device which controls conveyor motor speed in proportion to position or tension. In essence, then, there are two controls of speed, with the "master" VSS mentioned above integrating the top four belts as a group. Guillotine cutting, conveying, and quick inspection complete the initial stage before the pieces are finally loaded into tote boxes for the subsequent molding operation.

The next step in the production flow consists of the molding by hydraulic presses that mold and cure the rubber plugs into mounts. Control over the time cycle of these presses is completely automatic with master indication and regulation in the production office. After stripping the sheets of inter-connected mounts from the molds, they are stored in large tote boxes for a ready supply to the tumbling barrels.

This final process is carried out in tumbling barrels into which carbon dioxide is fed. Each of the three tumblers is driven by a Reliance V*S Jr. drive with complete finger-tip control right at the barrel. The CO_2 chills the rubber sheets until they are extremely brittle. All excess flashings and connecting pieces of rubber are broken off by the tumbling so that the individual mounts result. When the tumbling has been completed, the motor drives are stopped, the barrel opened, and the barrel opening is positioned directly over a shaker conveyor. The mounts drop onto this conveyor and travel to a point where they are transferred to a conveyor feeding into a rotating squirrel-

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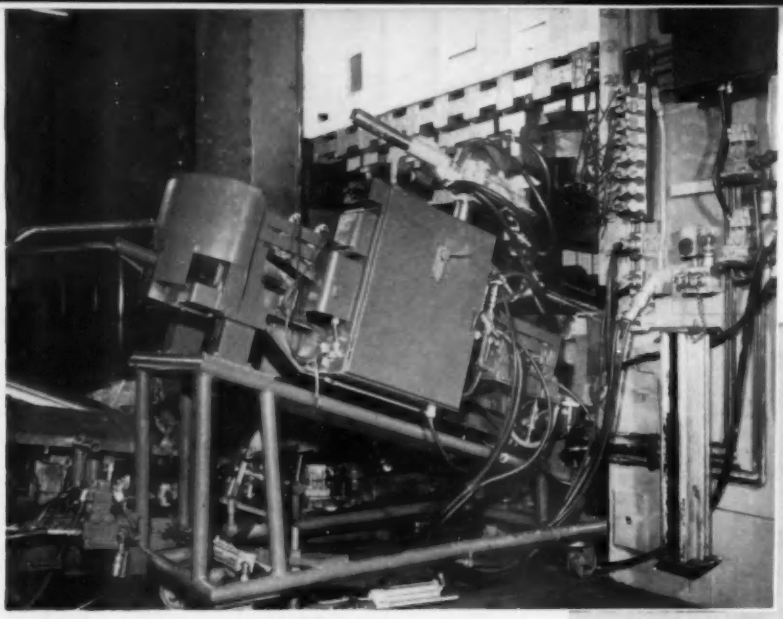
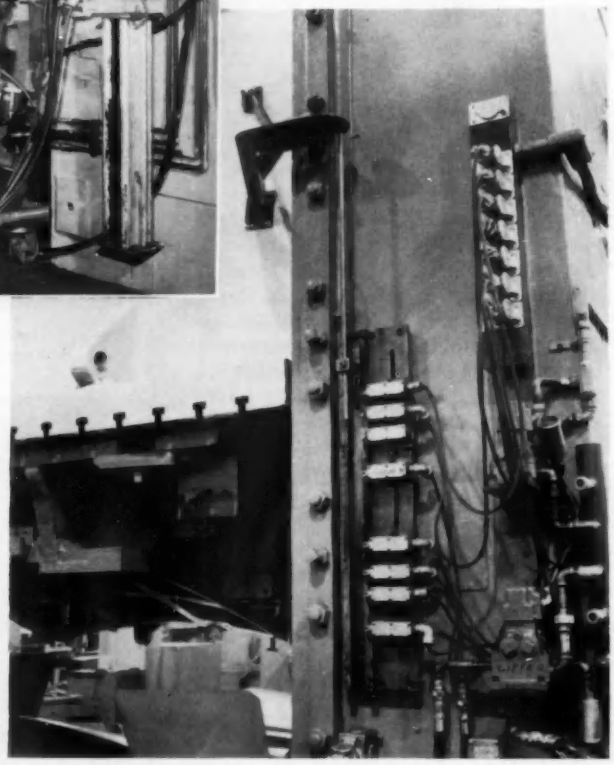


Universal side arm extractor designed by the Cleveland Plant automation section can be used on any of the 22 press lines in the plant.



Automation units are actuated by the drop-cam electric controls located on the press column. The driver to operate the switches is attached to the upper platen of the press.

By Thomas Mac New

Automated Press Lines *in* Ford's Cleveland Stamping Plant

FORD is now operating what is currently the last word in automated stamping plants at its new facility just outside of Cleveland (AI, Dec. 1, 1955). This all-new plant supplies approximately 20 per cent of the total Ford major functional body stampings.

Stampings move through the production lines with the aid of the latest automation and materials handling devices. Production at present is for the assembly plants for Ford, Mercury, and Lincoln. In addition to Ford car body work, the plant handles 60 per cent of Mercury and 75 per cent of Lincoln functional body parts.

Altogether, there are seven different makes of presses—Cleveland, Bliss, Danly, Clearing, Hamilton, Niagara, and Ferracute—used in the new plant. The largest press has a 1000-ton capacity while the smallest is rated at 90 tons. Presses used for major stamping operations are of the underdrive type. All of the larger presses are equipped with the Dynamatic electromagnetic clutch. McKay machines are used to handle all the coil stock which makes up some 80 per cent of the total steel used in the plant.

The entire overhead conveyor system, which is approximately two miles long, was built by Mechanical Handling while the 250 or so portable belt conveyors used between manufacturing operations were supplied by a number of manufacturers.

Most of the automation equipment used in the plant has been standardized and utilizes an air-mechanical system for operation. One of the major steps in the standardization program was the installation of similar power drive units in most of the transfer devices. The power unit uses a short stroke air cylinder which

moves the transfer mechanism mounted on movable racks, twice the distance of the stroke and, of course, at twice the speed.

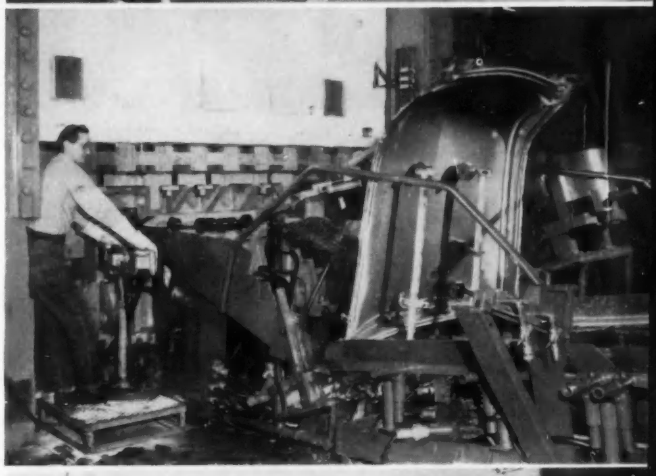
Actuation of the automation units is by means of drop-cam electric controls mounted on the press column. A contact or driver arm is mounted on the upper platen, so on the downward stroke of the press the driver arm passes over the series of electric switches. The switches can be adjusted to operate at any point during the stroke of the press.

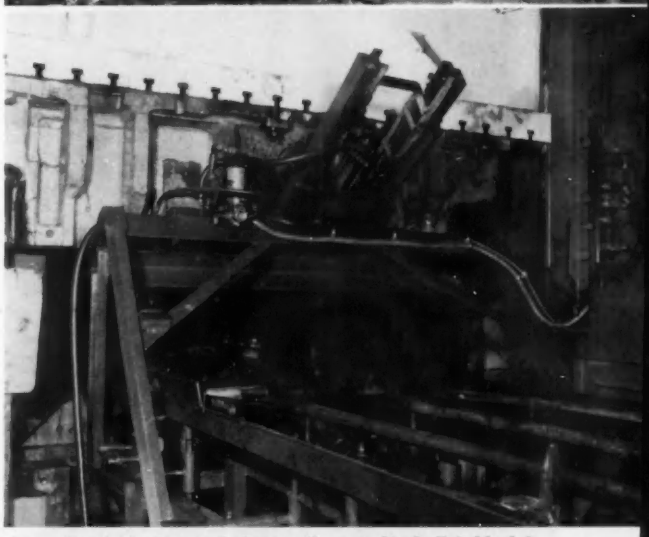
Ford's Automation Section at the Cleveland Plant designed and built much of the special equipment needed. This section devised, in addition to the drop-cam control, a universal side arm extractor to remove parts from the dies. These extractors have adjustable supporting columns which make them usable on any of the 22 major press lines.

Another innovation conceived by the Automation Section is the parallelogram transfer system which carries body parts into and out of die cavities. The device gets its name from its motions which resemble a parallelogram—forward, down, reverse, lift—during a cycle of operation.

An excellent example of the parallelogram conveyor mechanism is the automation equipment on the front hood-reinforcement line. Initially, the sheet metal for the part is cut off and blanked in a 186-in. by 108-in. bed Clearing press equipped with a side feed. Two parts are cut and blanked simultaneously, with one being ejected from the front of the press and the other from the rear. Blanks are then manually fed into a blankloader for the draw operation by sliding them over a gravity ball table. In the loader the sheet metal is automatically sprayed top and bottom before insertion in the die. After the initial feeding operation in the blankloader, the part is not manually loaded again until it leaves the main press line. This second operation, which is performed on a double-action, 700 ton Danly with a 108- by 72-in. bed, draws and flanges the work. A side arm extractor removes the workpiece from the die cavity and places it on a portable belt conveyor. The conveyor takes the part to the parallelogram loading and unloading device. In the third operation on a single-action, 600 ton Bliss, the hood-reinforcement is completely trimmed. The parallelogram extracts the work from the die, transfers it, and then places the part in the next loader. This is carried out for the next three operations. In successive steps, the part is flanged along the fender sides and rear, restruck, pierced for molding slots, and flanged along the front on single-action, 600 ton presses. In the last major operation, also performed on a Bliss press, the part is automatically loaded; and after striking, it is mechanically kicked from the die onto a slide table.

Ford's Automation Section designed and built a rather clever preform bender and automatic transfer mechanism for the instrument panel line. Blanks are loaded on a table equipped with movable fingers which push the work to a first station where the sides are notched and then to a final station where the sheet

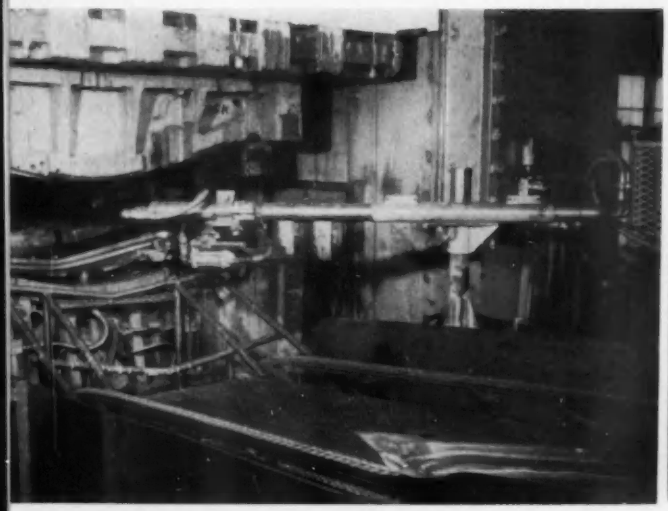


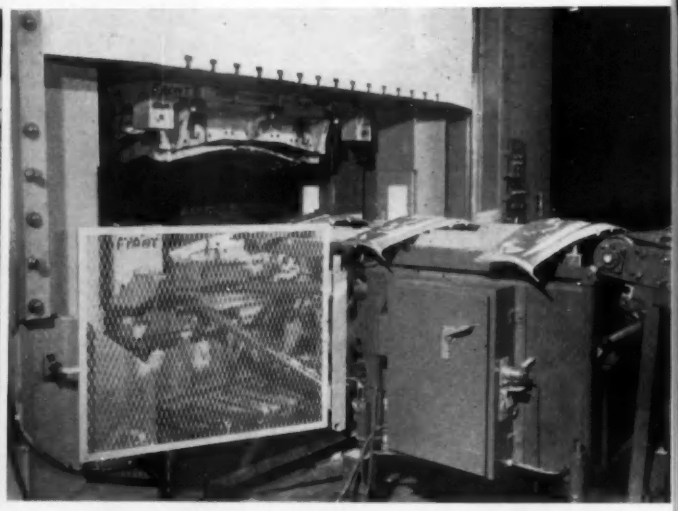


Top—Hood blanks are fed over the gravity ball table into a blankloader where both sides of the sheet are sprayed. The blankloader automatically inserts the part into the Danly press.

Center—Hood line automation includes such devices as this turnover and the universal side arm extractor in back of the turnover.

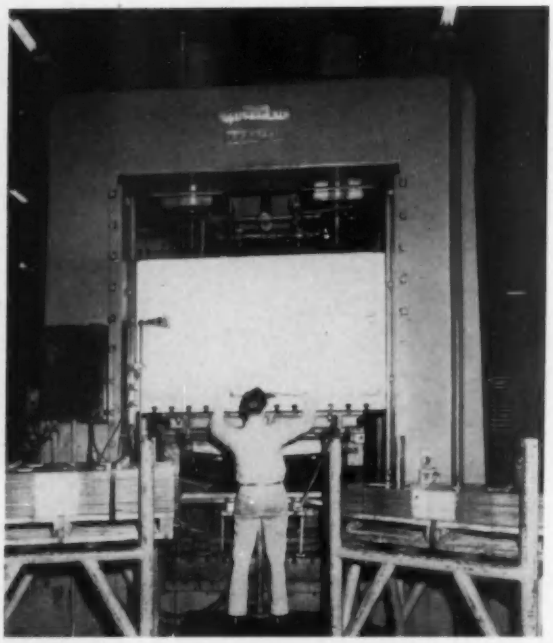
Bottom—As a hood is ejected from the die, it is kicked forward. The air-operated slide mounted on top of the A-frame is used to cushion the shock of landing and to guide the part onto the automation rails. The slide is equipped with soft rubber wheels for the purpose.





The side arm extractor in picture above removes the front hood reinforcement from the die in the Danly press and deposits it on a belt conveyor which carries the work to the parallelogram automation device.
Above, right—Parallelogram automation is used extensively on the front hood-reinforcement line. These units operate through the die to load and extract the workpiece in a motion which resembles the shape of the familiar parallelogram. This particular unit is behind a 600 ton Bliss which performs the fourth operation.

metal is bent to a parabolic shape. This preform has enabled the plant to cut down on scrap loss. After bending, the work is transferred transversely through the side of a Hamilton press and into the die cavity for the first stamping operation in the sequence.

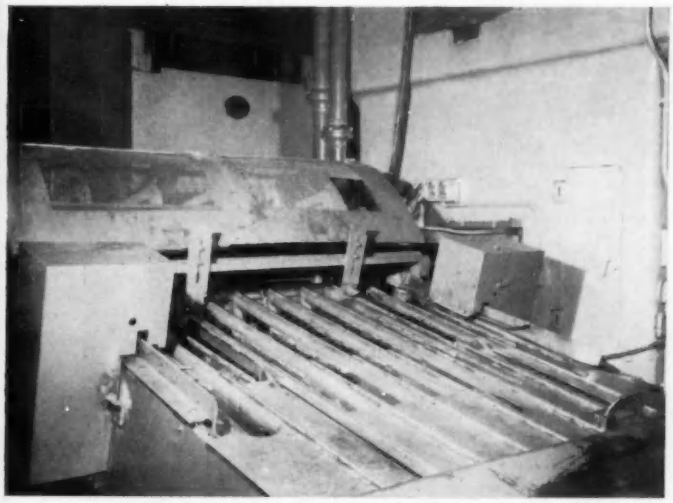


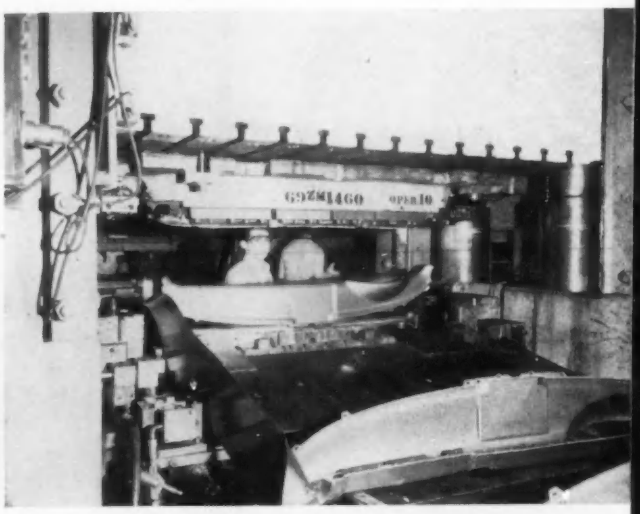
This 450 ton, 94 by 60 in. Cleveland underdrive press is used for stamping out package trays for Ford cars. Operations on such small parts often do not require a great deal of automation equipment.

Another well automated line produces hoods. Blanks are notched and cut off two at a time in a Clearing press which has a 186- by 108-in. bed. Each sheet is ejected automatically and taken to a McKay 84 in. rolling mill. Upon leaving the mill, the material, which is 0.036 in. thick, is transported by industrial truck to the first draw press. Sheets are fed over a ball gravity table and automatically sprayed top and bottom with drawing compound. Blanks are then automatically fed into a Danly double-action press of 800-ton capacity. This press has a bed 134 by 96 in. The part is removed from the die cavity by a universal side arm extractor and placed on a series of rubber rollers where it is picked up by a turnover mechanism. Automatically, the workpiece is inserted in another Danly press. This press is rated at 1000 tons and has a bed of 132 by 90 in.; it is utilized for finish trimming the hood.

At the rear of a third Danly press on the hood line, a mechanism has been installed which automatically removes the part from the die and transfers it without marring the exterior surface of the hood. Air cylinders at the rear of the press lift the hood clear of the die while another mechanism propels the hood forward. As the hood moves through the air, it is guided and slowed, to cushion the landing shock, by an air-operated slide mechanism equipped with soft rubber rollers. This unit is mounted on an A-frame just at the rear of the press and over the transfer mechanism which carries the part on to the next press operation.

Electrically, the rear floor plan line is the most complicated with 350 relays serviced by a Reliance 40 hp drive. One of the principal features of this line in respect to automation is what the Ford engineers have nicknamed "the Hong Kong Express." This unit is used for practically all automatic welding on the rear





Preform automation device used in conjunction with a Hamilton press on the instrument panel line. The unit notches bends, transfers, and loads the blank into the draw press. Above, right—On the Mercury instrument panel line automatic ejectors are used to remove the stamping from the die and onto the slide table where the piece is picked up by a belt conveyor. A Cleveland underdrive press is used for the operation.

floor pan assembly. As the floor pan moves to the first idle station, a spare tire well is automatically brought into position. When the floor pan moves under the tire well, the well is dropped into the cutout in the pan. During this phase, the front fuel tank supports are placed in position. The sub-assembly then is welded in a United welding press and passed on to the main automation line. In successive steps, the rear fuel tank vent pipe retainer and a cross member are added. The lower platen of a 70 by 70-in. Hamilton weld press lifts the pan into proper location, and the guns move into position to join the various parts. Next, body bolts and the center floor pan are placed in their respective fixtures in another weld press. The center pan is lifted into position by a hydraulically-operated knee. When the knee retracts, the pan is left on rails for transfer. After a sealant operation, the center floor pan is loaded into a fixture adjacent to the rear floor pan idle station. The two sub-assemblies are transferred to a 92 by 92-in. welding press for joining.

There are, of course, several press operations where automation is not necessary for various reasons. Mostly, the lines that have little or no automation are producing small parts. Typical lines are those using the new Cleveland underdrive presses for package trays and conventional presses for such parts as reinforcement ribs.

The rear floor pan assembly line incorporates a great deal of automation equipment. At this point, the spare tire well is elevated from floor height above the pan and then automatically dropped into the pan cutout. Safety guards over the chains on the left were removed for pictorial purposes.

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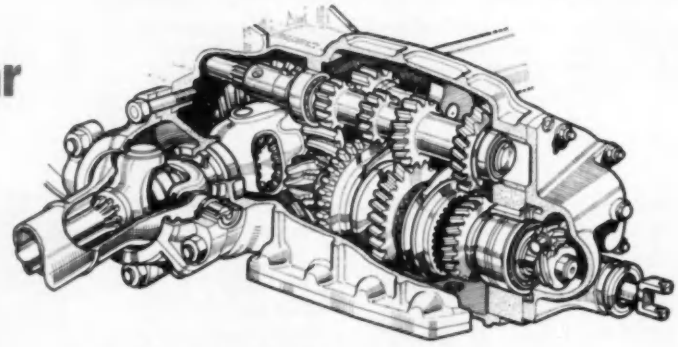
Revised Plan Allows Military To Make Use of Stored Tools

The new program announced by the Government to use machine tools which have been kept in storage will have no effect on the Defense Dept.'s present plans to purchase new equipment. Most of the tools, stored under a program established in 1953 by the Office of Defense Mobilization, are larger units which take a long time to build.

Under the new program, each military service will be permitted to borrow any larger machine it needs for urgent production schedules. In addition, each service now will be permitted to buy its own tools as it needs them for current programs. In the past, the Defense Dept. itself acted as the purchasing agent for all military divisions. The new arrangement is expected to effect greater efficiency.

Renault Dauphine four-door sedan

Renault Brings Out New Rear Engine Car



Cutaway view of the transmission and final drive

RENAULT, the largest French automobile producer, has added a third model, the Dauphine, to its passenger car line. Mechanically, the 51.5 cu in. Dauphine is similar to the smaller rear-engine model. Its four cylinder engine forms a unit with a single plate clutch and a three-speed transmission. It has a three-bearing cast crankshaft, wet cylinder liners, and a light alloy head with vertical valves. Although the cylinder bore has been increased, a large number of the engine parts are interchangeable between the two models.

With a compression ratio of 7.25 to 1, output of the engine is 30 hp at 4250 rpm.

The single plate clutch and the three-speed transmission are common to the two models, but a recent change is the adoption of the Borg-Warner synchromesh for second and third. Final drive is by spiral bevel gears with a ratio of 4.37 to 1.

Rack and pinion steering, as well as coil spring suspension front and rear, are practically the same for the two models. Where additional strength is required, this has generally been obtainable by heat treatment, without any alteration in the size of the parts.

While there is a high degree of interchangeability in the mechanical components, the bodies of the two types are entirely different. The Dauphine has a wheel base of 89.3 in., a front tread of 49.1 in. and a rear tread of 48.7 in., with an overall length of 155.5 in. Curb weight of the new car is 1397 lb.

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Wealth of New Equipment To be Shown at MHI Show

More new equipment will be exhibited at The Material Handling Institute's Exposition of 1956 than has ever been unveiled at a single material handling show, according to the MHI officials. A survey of the 160 exhibitors indicates that 1196 new developments and new pieces of equipment will be exhibited for the first time at the Exposition in the Cleveland Public Auditorium at Cleveland, O., from June 5 through 8.

Exhibitors also reported that more than $1 million is being spent on displays exclusive of the time of personnel. A total of $4.5 million worth of equipment will be included in the exhibits.

In addition to the exhibits, 12 technical sessions sponsored by the American Material Handling Society will be held in conjunction with the Exposition. They will be developed around the theme, "Integrated Handling—Management Profit Tool."

Vehicle Output in India Reaches New Record High

According to figures just released by the Indian government, 22,528 cars and trucks were produced in the country during 1955. This figure compares with a total of 14,462 units manufactured in 1954 throughout the nation.

Fifth Annual Spring Conference of the AIIE

INDUSTRIAL engineering is gaining new stature and industrial engineers as a class are due to find a more important place on the management team as they accept the responsibilities incident to the growth of automation techniques and the influence of automatic controls. That was the general consensus of speakers at the Fifth Annual Spring Conference of the American Institute of Industrial Engineers (AIIE) held in Cleveland in March.

Industrial engineering is subject to a changing climate due to the impact of automatic controls. The larger automotive plants have been employing the new techniques for many years, shifting to the more advanced mechanization and automatic controls in the new engine plants. The speakers at this meeting were unanimous in their opinion that parts makers and smaller volume producers—those that invariably are faced with lot or batch type production—must also find ways of harnessing automation and mechanization, and automatic controls.

Obviously, job lot production cannot employ the same methods or equipment. But ways must be found in each specific operation to utilize flexible, specialized equipment with judicious applications of automatic controls. The point is that the small organizations are operating in an economic climate of high labor costs established by the larger producers and thus are forced to adopt the most advanced methods—tailored to their needs—in order to maintain their competitive position and make a profit.

It was pointed out that an enormous variety of special tools are available for this purpose to management that keeps in touch with developments. We have today many useful types of hydraulic, pneumatic, and electronic systems, including programming systems that can be applied to small lot production. There is also a wide variety of extremely flexible machine tools that can be harnessed to meet specific problems.

Among examples of these are: tracer controlled lathes, automatic lathes, automatic screw machines, automatic cycle—drilling, milling, honing, precision-boring, grinding machines and other types of advanced design, all of which can be fitted with automatic loading devices. These are just as adaptable to small lot production as they are to mass production.

The application of advanced methods and techniques needs vision and the will to accept the new philosophy of manufacturing posed by automation. One of the best ways to get started, according to one expert, is to establish an automation section or department and give it authority to change methods and process where this is justified economically.

The speakers stressed the positive side of automation philosophy—that it creates new jobs by increasing productivity and lowering costs; that it provides a climate for new skills and higher job ratings. They decried the attitude of uninformed laymen and some labor leaders who preach that the new production techniques create unemployment. One of the speakers mentioned that in Russia, where labor certainly is abundant, the government recently created a new Cabinet post of Ministry of Automation to improve productivity.

But the very nature of the Conference and the widespread interest of AIIE members, much of the discussion was on a generalized level, dealing with principles and concepts. A number of industry representatives, however, had an opportunity to present specific case studies.

For example, P. H. Richardson, Hartford Special Machinery Co., described examples of highly flexible automatic production machinery that can be used for a variety of different parts by changing or rearranging sections of the machine. One of the specific examples illustrated by the speaker was a flexible type drilling machine designed for jet engine parts machining. It is of sectionalized design, integrated from standard elements such as the base, index table, columns, etc. It can be equipped with vertical column drilling heads, horizontal drilling and tapping heads, broaching attachment, etc. This concept is an extension of the so-called unit type equipment that has been used by automotive producers for a great many years.

Application of automatic controls, electronic data processing, systems engineering and other aspects of automatic controls for various functions were described by a number of specialists. David N. Smith, Jones & Lamson Machine Co., discussed the variety of input, internal, and external controls that are available for flexible individual items of machine tools, that make them readily applicable to the needs of job lot production.

Don A. Cargill, Cargill Detroit Corp., described the types of integrated lines that can be applied to small lot production, capable of producing finished assemblies from the raw materials at a high rate of speed. He gave examples of unit type machines currently being used in the Detroit area.

Mac M. Arlin, Arlin Products, Inc., showed a sound film that gave many examples of the well known electronically-operated, high speed inspection machines used in the automotive industries.

Automatic controls and automatic data handling equipment for continuous process industries were discussed at some length by A. H. Freilich, Minneapolis-

(*Turn to page* 125, *please*)

Advanced Methods for Making Six-Speed Automatic Transmissions

THE manufacturing facilities and techniques employed by the Allison Division, General Motors Corp., in the making of the unique six-speed automatic torque converter type transmission for Chevrolet trucks are noteworthy in setting the pattern for an operation of this character. Besides the special problems posed by the multiplicity of associated parts, and their larger and heavier design as contrasted with transmissions for passenger cars, there is the even more restrictive element of comparatively low volume that must be taken into account.

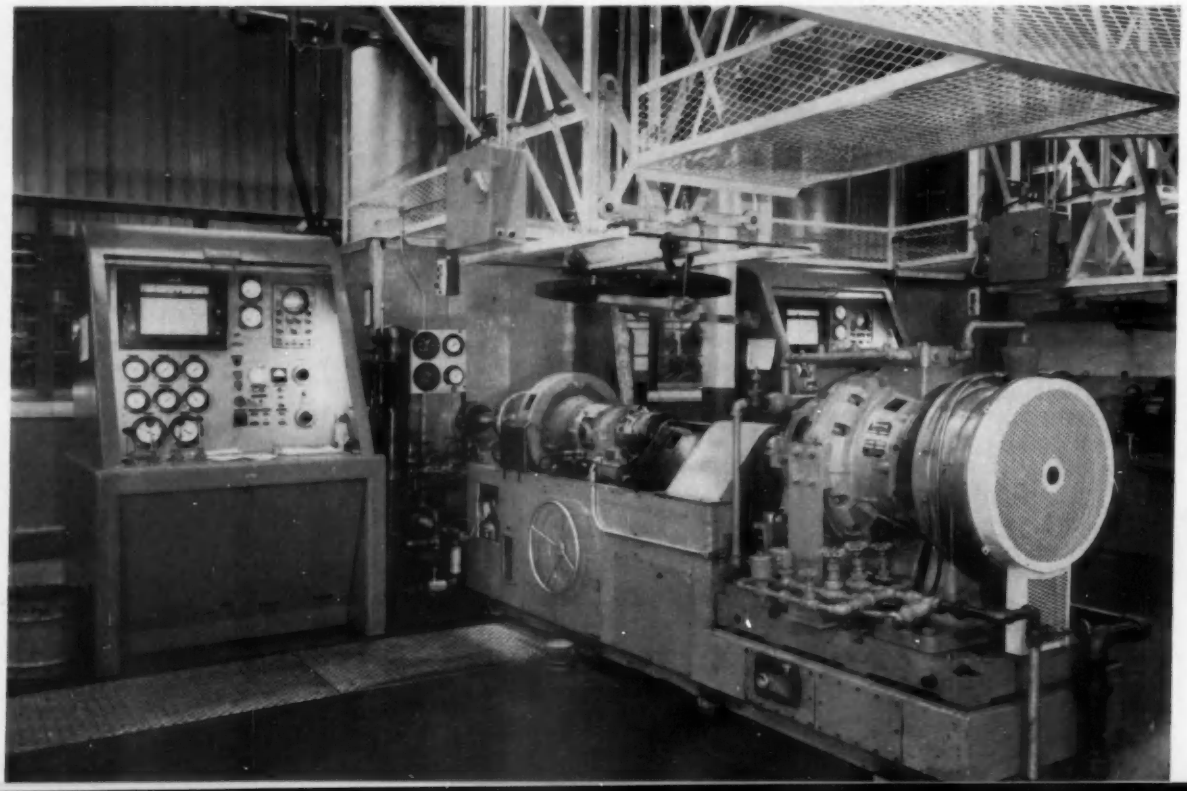
Despite these limitations, it is necessary to harness the most advanced methods of production so as to assure positive quality control with maximum economy.

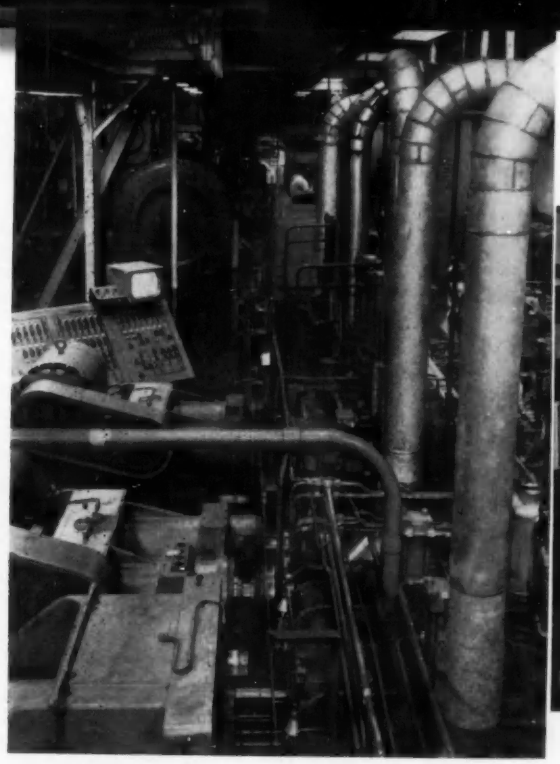
The sampling of operations selected for this study will go far to show how skillfully the problem was solved by the management. The examples to be described here not only emphasize the advanced character of the operation; they also highlight some noteworthy "firsts" in the selection of specialized machine tools.

Worthy of note, too, is the management of this special equipment. The production volume involved does not justify investment in machine tools for each individual part—with the notable exception of the Buhr transfer machine for the case—and in most instances, an individual machine has been tooled to handle two or more different parts. Flexibility, therefore, is an outstanding characteristic of this operation.

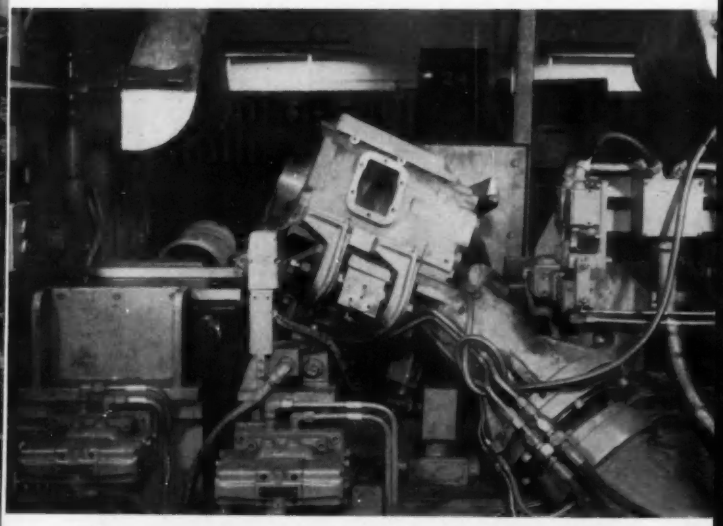
As one example, consider the cutting of internal ring gears. This transmission employs three different

One of two Buick V-8-driven final test stands for acceptance of Chevrolet transmissions. The control board at the left was supplied by Merz; the dynamometer in the foreground at the right is a Dynamatic. Directly above the transmission in the center background may be seen the Link-Belt carrier which lowers the transmission to the test stand and later raises it to the power conveyor system near the ceiling.





Forward section of the Buhr transfer machine for machining the transmission case. The control board at the loading station may be seen at the left in the background. The small TV screen, which is scanned by the operator, is mounted at the right hand corner of the panel. In the background is the second of the two large Davis and Thompson Roto-Matic milling machines.



Close-up near the center of the Buhr transfer machine, showing the inclined turnover fixture that rotates the case from a horizontal to vertical position. Incidentally, this is the station that is scanned by the TV camera.

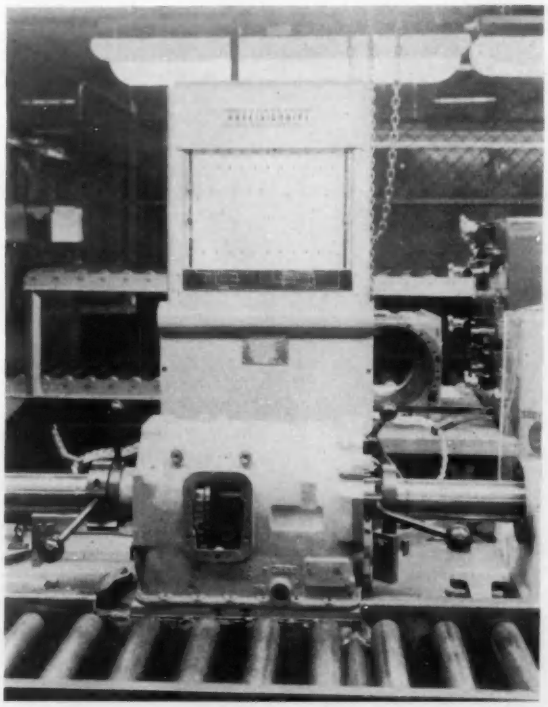
By Joseph Geschelin

ring gears each having 60 internal teeth. At least one of these is a rather thin-walled part, requiring special care in its handling. All three have the gear teeth cut in the large LaPointe vertical broaching machine, illustrated here. The broach has a 72-in. stroke and a rated capacity of 60 tons.

The large planet carrier, a casting of pearlitic malleable, is presented to a special Ex-Cell-O gun-drilling machine, shown here. The job is to gun-drill the four bores for the planet gear shafts, from the solid, in accurate alignment and to close tolerances, through the two parallel webs of the casting. One of the features of the tooling of this machine is the provision of two hinged forked arms, one on each side of the fixture. As the casting is placed in the fixture, the arms swivel into place between the two webs, serving not only as a solid support between them but also providing the drill bushings for guiding the gun drills.

Now we come to a "first," a special two-station vertical type New Britain tracer-controlled contouring machine. As illustrated, it handles the machining of both top and bottom faces of the large diameter converter cover. Tooling on both spindles is quite complicated since it is necessary to bore the large diameter pilot, bore all diameters, and turn and face at various points. Besides this, all critical dimensions are held to close tolerances.

Another interesting "first" is the Heald vertical precision-boring machine in which both the upper



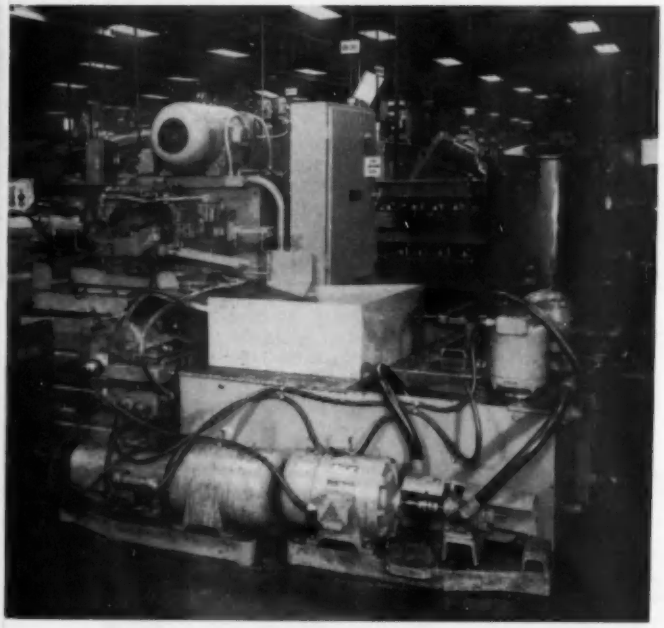
Final inspection station on the case. This is the Sheffield Precisionaire inspection machine that makes simultaneous checks on 12 qualifying dimensions by probing from both ends of the main bore.

and lower spindles are in rotation while the work is held stationary on the table. In this case, the machine handles the converter housing which requires facing of the inside diameter for the front pump; boring and facing of the retarder bore on the outside of the part. Both faces are held to close tolerances as to size and flatness of the converter housings.

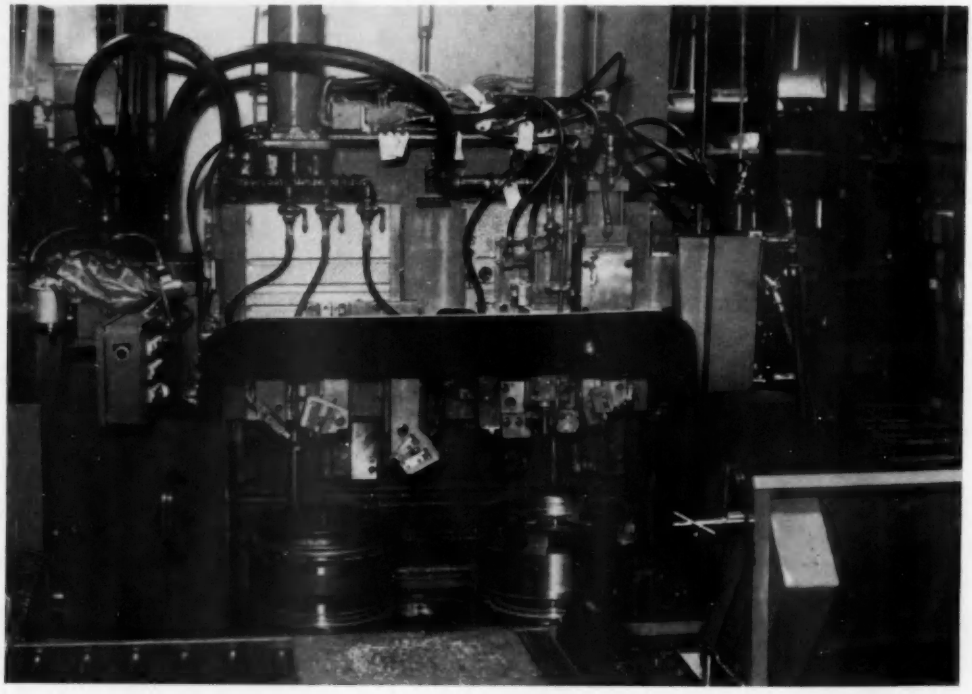
The assortment of aluminum die-cast valve bodies is quite impressive in terms of their out-size and complexity. In this area are found a number of the largest Kingsbury multiple-head drilling machines to be used in an automotive plant. The one illustrated has a total of 11 heads—nine vertical, two horizontal. It is set up for the main valve body which requires precise boring of seven, stepped diameter, through bores. Because of the nature of the stepped diameters, the job requires double-indexing, once for one side, then for the other. The bores are drilled, semi-finish- and finish-reamed. In addition, the horizontal heads drill and tap the mounting holes while vertical heads drill and tap cover mounting holes. The bores must be held for size within ± 0.0005 in. and to a surface finish of 80 microinch (minimum).

The transmission case, the largest and most intricately machined element, is distinctive in having not only a complete line of equipment but featuring the only transfer machine used in the department. Castings are chemically cleaned in a Kolene bath, then the valve side is finish-ground and locator holes are drilled and reamed in a special machine at the start of the line. This face with its locator holes serves to locate the part in succeeding operation.

The next step is the milling of both ends in a large Davis & Thompson Roto-Matic milling machine. This is followed by milling the sides in another Roto-Matic. Both machines are equipped with continuous rotating drum type fixtures.



Gun - drilling of the four bores in planet carriers is done in the special Ex - Cell - O machine, shown above.

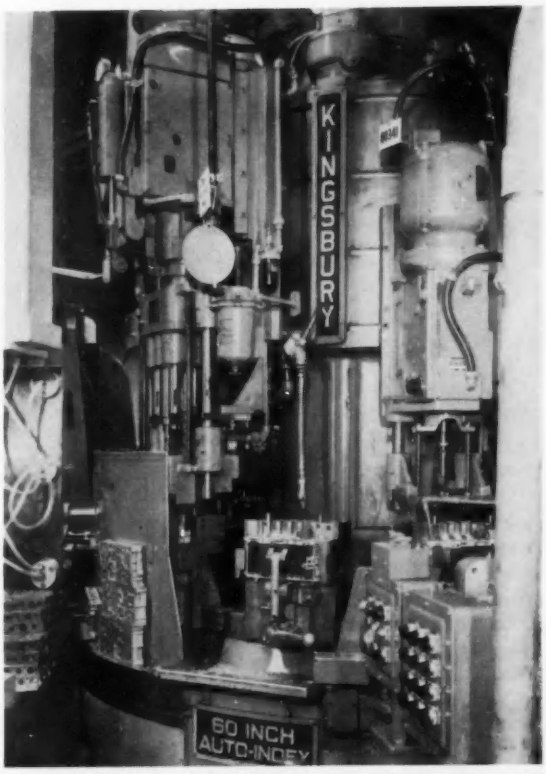


Guards have been removed to take this close-up of an interesting "first"—the two-spindle, vertical type New Britain precision - boring machine for boring and facing operations on converter covers. The cycle for both spindles is tracer controlled.

All of the remaining operations, including the detail stages of drilling, counterboring, reaming, tapping, etc., are done in an automatic cycle through the large Buhr transfer machine. In addition to the miscellaneous operations the machine also bores the stepped diameters through the main center line of the housing. Rough boring is done initially, finish-boring is done at the last station of the machine. Incidentally, all of the boring is done with milling cutters.

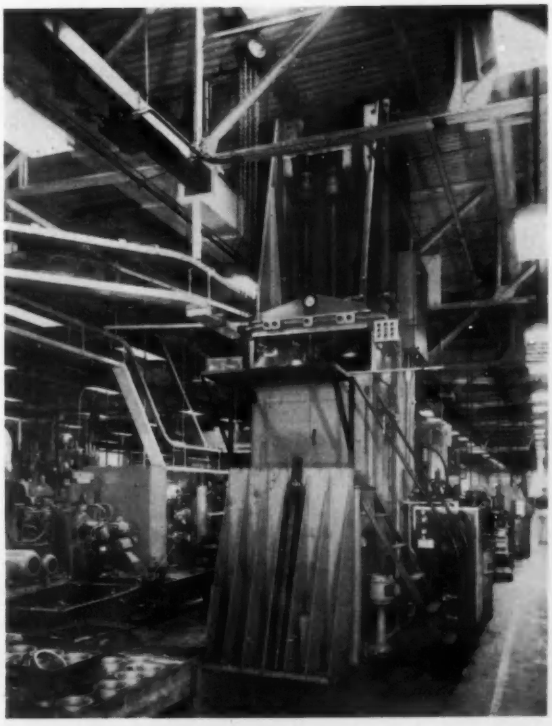
The Buhr transfer machine has some distinctive and uncommon features worth noting. It is the first transfer machine we have seen to date to be equipped with its own closed-circuit television system. The housing is handled in two distinct stages: first horizontally, then about midway down the machine, it is turned into upright position to permit work on the sides. The automatic turn-over to accomplish this is another unusual device. As illustrated, it consists of a motorized pedestal inclined at an angle of 45 deg to the conveyor. Rotation of the pedestal turns the housing upright and in correct location on the transfer conveyor.

Since the machine is quite long and because it would be damaged if the big casting were received in the wrong position, it was decided to install the closed circuit TV to enable the operator to observe the station continually without leaving the control board. The illustration of the control station shows the small TV set located at the top. The scanning camera is mounted permanently near the turnover station. (*Turn to page* 110, *please*)



One of the large 60-in. Auto-Index Kingsbury drilling and reaming machines on the valve body line. Seen here is the loading station for the large valve body. The machine has nine vertical and two horizontal heads.

This vertical type Heald Bore-Matic for boring and facing converter housings is a unique piece of equipment. It has two vertical spindles—one above the fixed work table; the other below.



The teeth are broached in 60-tooth internal ring gears in this 60-ton LaPointe vertical broaching machine which has a 72-in. stroke.

Swedish Automobile Manufacturer

AKTIEBOLAGET Volvo, major automotive manufacturer in Sweden, recently placed in operation in Goteborg what is considered to be the most modern synthetic enamel body paint shop in Europe with many features of interest to all car producers.

Perhaps one of the major points of interest is the utilization of electrically operated, radiant type drying ovens for all operations. Electrical energy has become more widely available in the Scandinavian countries with the development of hydroelectric power plants and although its cost still is high, the fact is that the cost of coal and oil has been rising much more rapidly than that of electricity. From the standpoint of over-all economy, electrical energy has become quite competitive when one takes into account such factors as first cost, maintenance, amortization, flexibility, time required for warming up, etc.

The facility to be described here illustrates the compromises that must be faced by plant engineers in Sweden due to strict government restrictions on the size and investment in industrial buildings. In fact, it is a common experience to have a waiting period of at least 24 months before government approval is given.

By the time approval had been obtained in this instance, requirements had been increased and later developments in techniques and equipment made it necessary to reconsider the layout from the standpoint of the best compromises that would fit available floor space.

The final layout, as shown on the floor plan, utilizes wide spray booths, short drying ovens and tunnels. It is designed for a capacity of 25 bodies an hour. In adopting electric power for heating drying ovens, Volvo took advantage of recent developments in which radiant field intensity is held at a far higher level than with any other heating medium, due to the fact that energy flow as a function of temperature of any portion of the radiating surfaces may be readily reapportioned to meet varying requirements. Consequently, drying tunnel lengths could be readily reduced—and drying speed correspondingly increased—without sacrificing flexibility. This made it feasible to squeeze extra capacity out of a relatively small floor space.

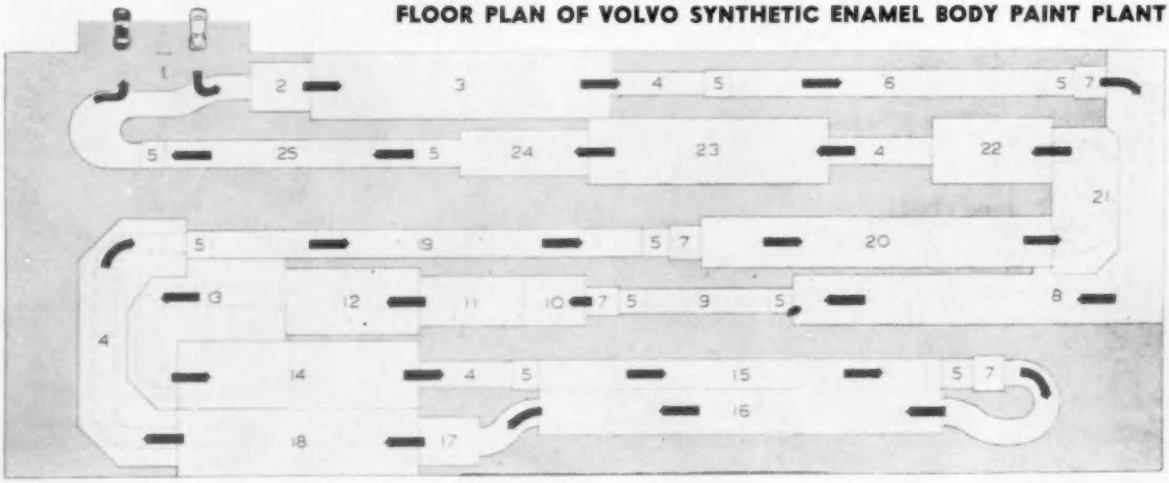
Examining the compact floor plan, it will be noted that the flow of operations occurs in a tight sinuous pattern starting with Station 1 at the upper left hand corner. This station handles loading and unloading as well. It may be noted here that metal cleaning and Bonderizing are performed in another department before reaching the paint shop. The sequence of operations then is as follows:

2. Tack rag
3. Hot spray primer
4. Flash off
5. Air seal
6. Drying oven—15 minutes at 360 F.
7. Cooling
8. Wet sanding
9. Drying oven
10. Blow-off and inspection
11. Petrol wash
12. Touch-up primer
13. Tack rag
14. Cold spray sealer
15. Drying oven—21 min at 290 F.
16. Sanding and petrol wash
17. Tack rag
18. Cold spray finish coat
19. Drying—21 min at 280 F
20. Repair-sanding and masking
21 Tack rag
22. Touch-up primer
23. Spray finish coat
24. Flash off and demasking
25. Drying oven—12 min at 280 F

Another noteworthy innovation (see item 3) is the use of hot spray equipment for the prime coat.

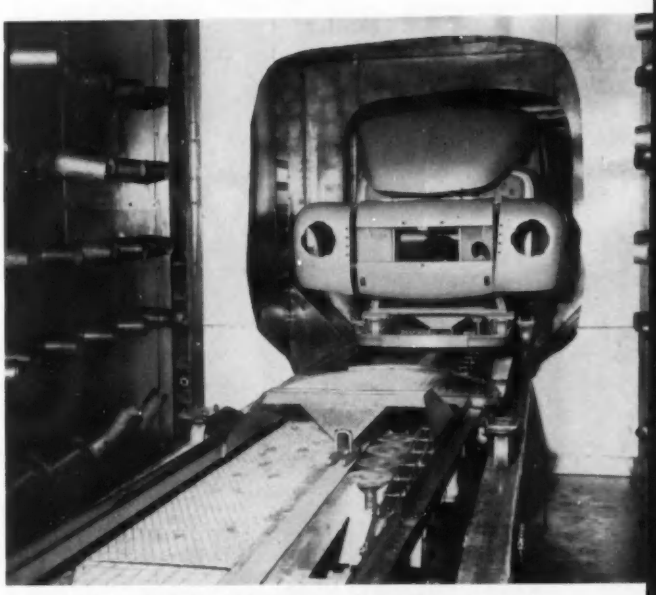
It will be seen that after the line coils around to

FLOOR PLAN OF VOLVO SYNTHETIC ENAMEL BODY PAINT PLANT



Has Compact, Modern PAINT SHOP

By Joseph Geschelin



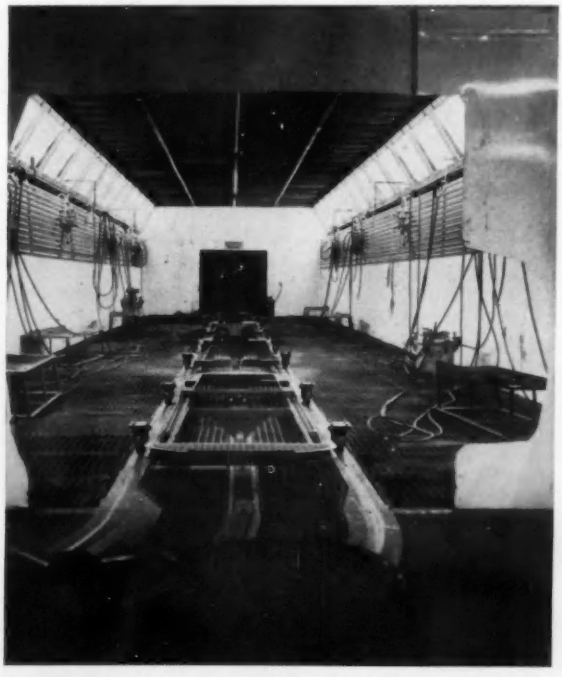
Exit end of one of the drying ovens. The cooling air nozzles are seen in the foreground on the sides. The main conveyor line is directly in the foreground. The transfer point from the oven conveyor to the main conveyor is at the right in the foreground.

Station 18, it begins the return loop ending at Station 1 for unloading.

Spray booths, as finally developed, are 20 ft wide whereas the ovens and drying tunnels are only 10 ft wide. The problem that remained was how to arrange the conveyorized movement of bodies in such fashion as to crowd more bodies into the drying tunnels—to speed up the flow at these points without interfering with progress of the entire line. Spacing of bodies on the main conveyor was established at about 19 ft, while spacing through the drying tunnels was reduced to 16 ft to effect the desired flow.

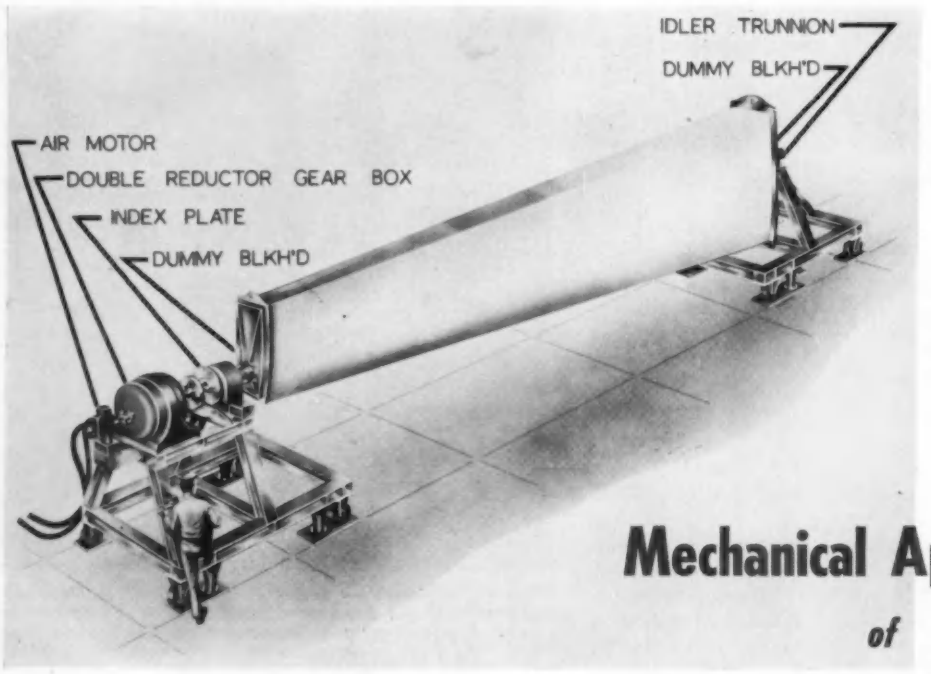
After considerable experimentation this change in rhythm was effected by means of special transfer equipment, resulting in the proper synchronization of movement at the entry and exit of tunnels. Briefly, the solution was found in the installation of synchronized side chains at various points along the common conveyor. These pick up the bodies as they enter the tunnels, transport them at closer spacing and,

(*Turn to page* 100, *please*)



Interior of finish-coat spray booth. Body carriages on the main conveyor may be seen in the center.

View in gallery showing a portion of the synthetic enamel mixing room.



Mechanical slushing device which is installed in an explosion-proof room

Mechanical Application of Integral Tank Sealant

By Robert W. Briggs
Douglas Aircraft Co., Inc.

THE use of integral fuel tanks in modern aircraft is contingent upon the ability of the airframe manufacturer to prevent corrosion and leakage. This is accomplished through the application of a sealant material in a hydrocarbon solvent.

In the past this sealant has generally been applied by brushes in the hands of workers who were required to enter the tanks. Duplication and ommission of coverage by this method could exist, and the obviously disagreeable work assignment together with safety hazards and excessive time consumption necessitated the consideration of an improved method.

This problem has been solved at the Douglas Aircraft Co., Long Beach Division, through the use of a mechanical slushing device installed in a specially constructed explosion-proof, air-conditioned room.

The Tool Design Group, to which this job was assigned, was faced by a parameter of interesting requirements. Aside from geometric configuration of the wing resulting in streamwise structural stations due to swept back wings on one model, the principal mechanical problem was excessive weight of the large transport wing tanks on another model. This weight factor is increased when its shift or movement is induced through rotation of the tank.

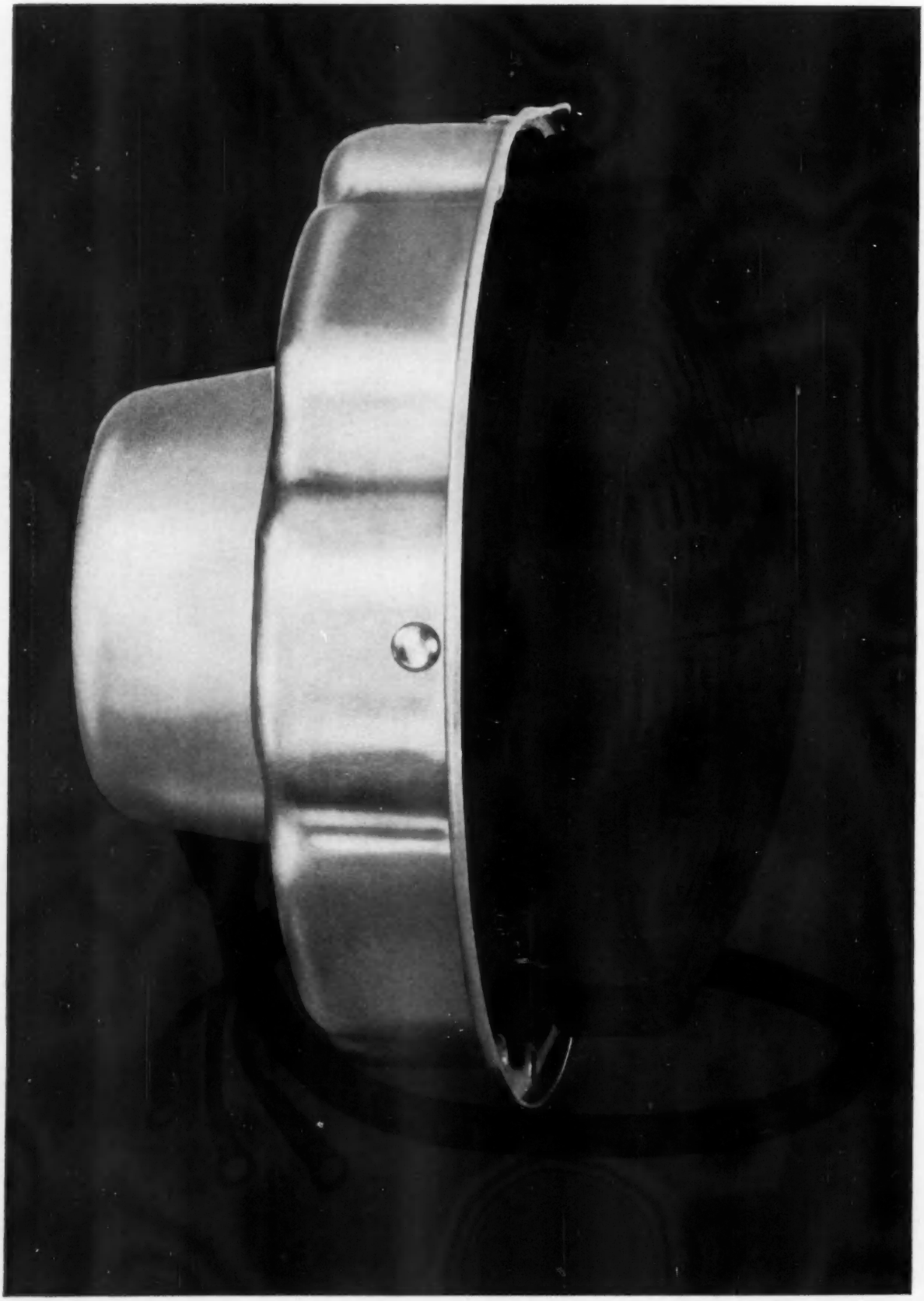
The mass moment shift of fluid flow in irregularly shaped structures results in a variable horsepower requirement and consequent couples which are dependent upon quantity of sealant as well as some other minor variable factors. (CG, axis of rotation, specific gravity of sealant, taper of wing, etc.) This was surmounted by a double herringbone radial gear reductor of commercial design driven by an air power motor. Air power was dictated by the explosion-proof requirement.

Attachment to the integral tank wing is made either through the use of dummy bulkheads which carry the power trunnion on the outboard station and the idler trunnion shaft on the inboard station, or through the use of cradled idler wheels, the axis of which is coincident with the wing axis.

The wing is filled up to 70 per cent capacity with EC 776 sealant and it is rotated at ½ rpm, through a gear reduction air motor drive. After several revolutions the complete coverage of all internal structures is assured. Air pockets in stringers and clip attachment areas are exposed to prolonged slushing of the sealant.

Drainage of the tank follows the slushing operation and is facilitated through the ability of the slushing fixture to position the wing tank in attitudes conducive to rapid draining. Ventilation of the solvent vapor is next accomplished through displacement with air. This prevents "washing off" of the sealant material through condensation upon the walls of the tank of the solvent vapor.

The entire operation is safer and quicker than a hand method could be and the resultant finish complements production methods of a modern aircraft company.



Kaiser Aluminum helps

HALL LAMP COMPANY

reduce costs . . . improve quality!

PROGRESSIVE ENGINEERS of Hall Lamp Company recently changed material specifications for the manufacture of headlamp outer bodies to aluminum. The bodies are supplied in headlamp assemblies for Packard, Plymouth, De Soto, Hudson, Willys, Nash and Rambler cars.

Aluminum made it possible for Hall Lamp engineers to design a higher quality part and, at the same time, reduce production costs.

FINISHING OPERATIONS ELIMINATED

Because aluminum is highly corrosion-resistant, no finish of any kind is necessary to protect against exposure to road splash.

This greatly simplifies production. After being formed, the bodies go *directly* to final assembly . . . thus eliminating in-plant operations and equipment formerly required for cleaning, priming, and painting. This reduces costs and also makes it possible to increase valuable manufacturing space.

Shipping costs are lower, too, because aluminum is one-third the weight of the material formerly used.

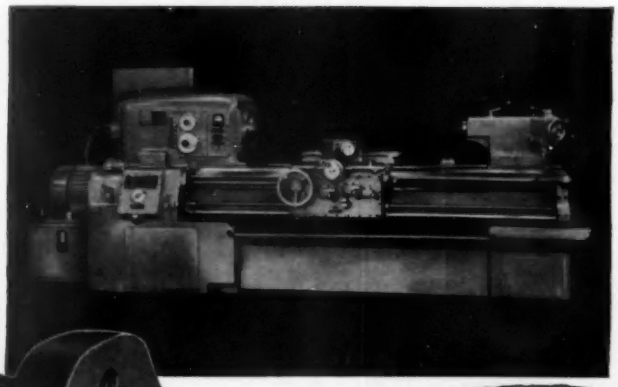
Aluminum headlamp outer bodies are one more example of how this versatile metal combined with sound engineering can improve quality and reduce costs in the automotive industry.

Make our automotive development engineers your "idea partners." Let us combine your knowledge of your product with our experience with aluminum to help you obtain maximum improvements and savings.

Also, if you need assistance in finishing, welding, forging, roll-forming, extrusions, stampings, castings —or desire any engineering service or fabricating counsel—our development engineers will gladly provide it.

Call our Automotive Development Division, TRinity 3-8000, Kaiser Aluminum & Chemical Sales, Inc., 1414 Fisher Bldg., Detroit 2, Michigan; *General Sales Office,* Palmolive Bldg., Chicago 11, Illinois; *Executive Office,* Kaiser Bldg., Oakland 12, California.

Kaiser Aluminum



USED ON MONARCH LATHES—The Monarch Machine Tool Co. uses a Pesco Reversible Pump to provide hydraulic power on its Series 62 and 80 lathes for headstock shifting and four-way power rapid traverse, and on the Series 90 lathes for head-stock shifting. Pump is belt driven by main drive motor (left).

PESCO REVERSIBLE HYDRAULIC PUMP—Model 051001-170. Gear type, positive displacement pump delivers 3.6 gpm at 1800 rpm and 1000 psi. "Pressure Loaded"* bearings assure longer service life and higher efficiency.

unique Pesco Hydraulic Pump has

one-way flow... regardless of rotation!

No matter which way you rotate this new PESCO Hydraulic Pump, flow is always in the same direction—inlet and outlet ports do not change! Startling? Yes . . . but it is typical of the valuable contributions now resulting from PESCO's creative engineering.

This PESCO pump is the answer for applications having a dual rotation power source, but requiring single direction hydraulic flow. On machine tools, for example, it can be run off the main drive motor to provide constant hydraulic power regardless of rotation. And for power take-offs on trucks and tractors, this pump gives correct flow independent of rotation.

Where can you use this pump? Samples are in stock and available to original equipment manufacturers for testing. Production requirements can be met promptly. For detailed information or specifications, contact your nearest PESCO sales engineer, or write: PESCO, 24700 North Miles Road, Bedford, Ohio.

*PESCO's patented principle of gear pump construction

Engineering Pesco Production

PESCO PRODUCTS DIVISION
BORG-WARNER CORPORATION
24700 NORTH MILES ROAD • BEDFORD, OHIO

Producing the Best in Hydraulic Pumps, Fuel Pumps, Electric Motors and Axial Flow Blowers

PESCO B-W BORG-WARNER TRADEMARK

All off-the-highway earth-moving equipment... dozers, scrapers, dump trucks... pose special hydraulics problems. The bulk, tonnage, and rugged service impose conditions that shoot an "ordinary" or "standard" formula full of holes. This is true of all heavy-duty equipment and especially so with long-stroke telescopic cylinders!

HYDRECO®

LONG-STROKE HYDRAULIC TELESCOPIC CYLINDERS

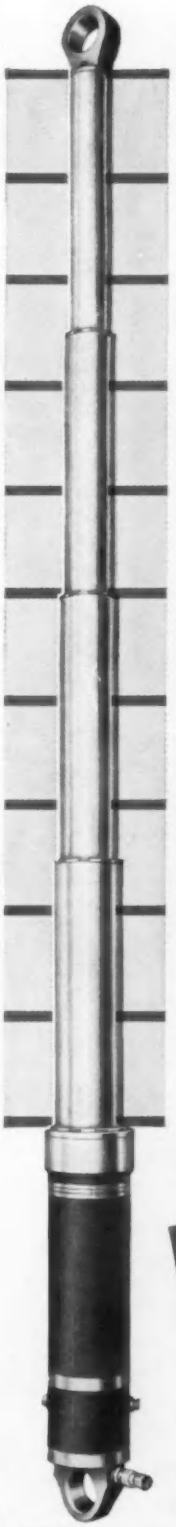
HYDRECO Cylinders are the result of many years of design and production experience. They're custom built for the service they face. They can be designed to meet your special requirements of space, mounting, function and load. You can have HYDRECO Cylinders with strokes to 20 feet or more and for loads requiring outer sleeves as large as 10 inches in diameter and system pressures to 1500 psi.

Telescopic cylinders are tough to build. No other cylinder calls for such close tolerances and perfect finish... no other type requires so much in design and production "know-how." Engineers who want "the bugs" out of their heavy-duty mobile equipment from the start specify HYDRECO!

Whether your problem involves 1 ton or 75 tons, the broad experience of HYDRECO engineers in finding the *right* answer can save you time, money and grief.

Write

—let HYDRECO engineers show you how you can improve your equipment with custom-built HYDRECO Telescopic Cylinders.



BIG DART EQUIPMENT SPEEDS CONSTRUCTION

OFF-THE-ROAD DUMP TRUCKS CARRY 75 YARDS PER LOAD

It's no problem at all to carry away, in a single load, half the dirt from an average home basement excavation. Modern off-the-highway dump trucks, hauling 75 tons or more of earth and over-burden, make short work of moving a hill or filling a valley.

Dumping these giant loads is done by means of big Telescopic Hydraulic Cylinders. Because truck bodies are so large, they require cylinders of unusually long stroke and capacity to raise them to full dumping position. During this operation it's an absolute "must" that all sleeves extend smoothly with no sticking or binding. Above all, safe operation is essential.

Downtime with this equipment costs big money. These giant trucks run day and night, rain or shine, on all sorts of jobs — so, cylinder maintenance must be negligible.

Many truck builders have made these big models practical and profitable with HYDRECO Fluid Power. Their experience has shown that HYDRECO Cylinders do the job and that they're safe, smooth operating and require a minimum of maintenance.

One of these builders is the Dart Truck Company, Kansas City, Mo., whose new 75-Ton capacity dump body is shown here. This model uses two 120-inch stroke HYDRECO Telescopic Cylinders. Fluid Power for the circuit is provided by two HYDRECO Pumps and control is by means of a HYDRECO Hollow-Plunger Valve.

ENGINEERS

Exceptional opportunities for men of imagination to express new ideas in the design and development of Fluid Power Components. Company expansion and progress promise rewarding futures for engineers who qualify. Write, giving experience and full details.

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Gentlemen: We'd like to discuss the subject of Telescopic Cylinders with one of your engineers. We understand there is no cost or obligation for this cooperation.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

Can STROMBERG—champion economy carburetor—help sell cars?

The question is directed to manufacturers whose cars are not yet equipped with Stromberg Carburetors. Car makers using Stromberg now are also using its outstanding economy record in the Mobilgas Economy Run to convince thousands of economy-minded customers.

A large segment of your market—people in every income bracket—is always motivated by economy of operation as well as style, power and other good features. Proof that the motor car industry is well aware of this fact is its participation in the Mobilgas Economy Run every year, knowing how much a victory helps new-car sales.

Stromberg-equipped cars have won the coveted Sweepstakes Award in this national economy tournament two straight years!

If economy is a touchy subject instead of a good, solid selling feature with your line of cars, it will pay you to make comparative efficiency tests with Stromberg Carburetors against the field.

Remember, for more than forty years more advances in carburetion have been initiated by Stromberg than any other manufacturer. Stromberg application engineers are at your service.

ECLIPSE MACHINE DIVISION OF BENDIX AVIATION CORPORATION

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Stromberg* Carburetor Bendix* Electric Fuel Pump Bendix* Folo-Thru Starter Drive

*REG. U.S. PAT. OFF.

ECLIPSE MACHINE DIVISION ELMIRA NEW YORK

Bendix AVIATION CORPORATION

News of the MACHINERY INDUSTRIES

By Thomas Mac New

Machine Tool Hydraulic Forum Scheduled by Vickers. Automatic Machine Conditions Automatic Transmission Pinions. Crosby Gets Government Post.

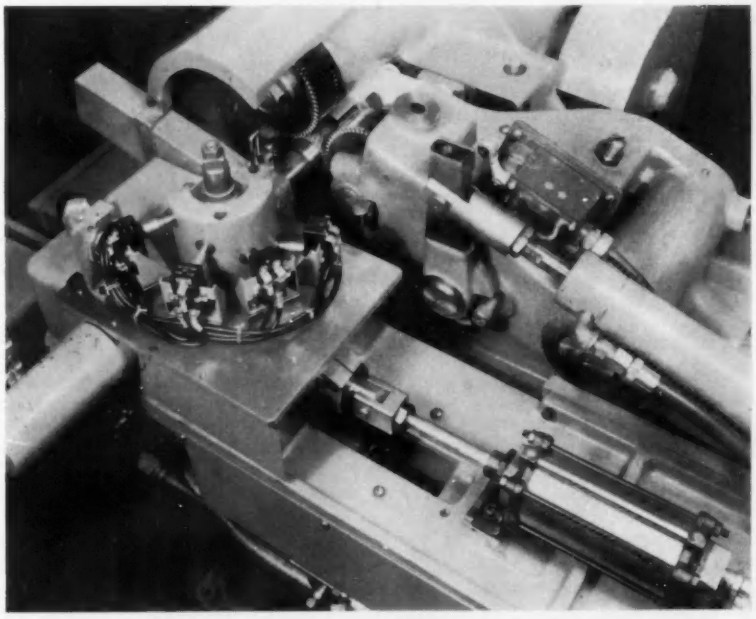
Vickers Will Hold Second Hydraulic Forum

Vickers has scheduled its 1956 Production Machine Tool Hydraulic Forum for May 24 and 25 at the Engineering Society of Detroit building. This second forum, like the first, is to promote further improvements in hydraulic components and systems through an open exchange of information on current problems.

Louis F. Polk, president of Sheffield Corp., and head of the NMTBA, will be the keynote speaker for the 1956 event.

Co-moderators for the two-day forum are to be Hans Ernst, director of research at Cincinnati Milling Machine Co., and Russell L. Dustman, productive equipment manager for Chevrolet. Taking part in the open discussions this year will be representatives of machine tool builders, users, hydraulic accessory manufacturers and key Vickers personnel. Attendance at the forum is by invitation only. The agenda is prepared from questions submitted in advance by forum participants and will provide coverage of the full range of industrial hydraulics.

Joseph P. Crosby is now director of metalworking for BDSA.



Setup for conditioning automatic transmission pinions in a Fellows No. 8B gear burnishing machine.

Conditioning Pinions for Automatic Transmissions

Fellows Gear Shaper has worked out an automatic process for conditioning the tooth surfaces of hardened pinions used in an automatic transmission. According to Fellows engineers, the process requires only a few seconds per piece, but the effect on the pinion tooth surfaces is equivalent to that resulting from a run of a number of hours in a transmission. The conditioning machine is a Fellows No. 8B gear burnishing unit. The pinion is run in close mesh with three hardened work-gears. There are two speeds for the shaft on which the drive gear is mounted. Slow rotation for loading and unloading operations is obtained by means of an auxiliary motor having an overrunning clutch. When electromagnetically coupled, the main motor overtakes and overruns this clutch to give fast rotation for the pre-set running time. One work-gear is mounted in a fulcrumed arm through which the necessary pressure is applied. This arm is raised by an air cylinder for loading and unloading the work. A second cylinder actuates a ram in which there

(*Turn to page* 100, *please*)

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Vertical Bore-Matic for Multiple Operations

Heald vertical Bore-Matic two-station machine will handle parts up to 16-in. diam.

NEW design for increased efficiency is featured in the announcement of a vertical Bore-Matic two-station machine. Vertical hydraulic operating slide units mounted on the base column can be arranged to carry a variety of tooling or auxiliary tool slides. The use of angularly mounted auxiliary hydraulic slides allows tooling to approach work over a wide range of angles.

The work pieces are loaded down onto the rotating workholding fixtures which are mounted on vertically positioned precision boring heads. The boring heads are driven by individual motors mounted at the rear of the base.

In the setup pictured, multiple tool blocks are mounted on horizontally positioned hydraulic slide units which in turn are positioned on vertical slide units, also hydraulically powered. This bi-way slide arrangement is for boring, chamfering and facing automotive transmission parts; the vertical slide movement accomplishes the boring and chamfering and the horizontal slide movement generates the face.

Continuous production can be maintained by loading one station while the other is borizing, since each station may be independently operated. Machine and cycle control pushbuttons are grouped at the front of the machine with double pushbuttons for cycle start at each station. This provides an additional safety feature by making it necessary for operator to use both hands to start the cycle. Feed controls for rapid traverse, boring, turning, facing and related borizing operations are readily accessible, and are available for either or both the vertical slide unit and the horizontal slide unit.

The capacity of the standard vertical slide unit ranges to parts having a diameter of 16 in. The machine is adaptable to a wide range of parts, including the machining of flywheels, impellers, bell housings, clutch plates and similar parts. *Heald Machine Co.*

Circle 30 on postcard for more data

Automatic Drill

THE new air-operated Aro automatic drill performs a complete cycle, automatically. Motor starts, drill traverses rapidly to the work, feeds at pre-set rate while drilling hole, then retracts and shuts off when hole is completed.

These drills are offered in a choice of 15 models and five speeds for processing a wide range of metals, from thin sheets up to six-in. alloy steels. They can be used singly or in multiples and may be bench-mounted, suspended or locked to drill jigs.

The five-step work cycle is accomplished by: Four-way air valve, piston type, which can be operated manually or by remote control to start cycle and provide automatic return; rapid traverse stroke which moves drill rapidly to the work and shortens the time cycle; hydraulic feed control for feed rate according to job requirements; adjustable stroke length with micromic adjustment nut accurate to 0.002-in.; and built-in automatic return which retracts the drill and completes the cycle.

Additional features include interchangeable gearing for fast conversion to any of four other speeds; and

Aro air-operated automatic drill

adjustable air regulator for fine adjustment of motor speed, or to shut off air in motor and move piston forward for drill changing.

They are available with 2, 4 or 6-in. stroke lengths, and with speeds of 4600, 2500, 1200, 650 and 350 rpm; drilling capacity from ¼ to ½-in. in mild steel, 5/16 to ½-in. in aluminum or brass. *Aro Equipment Corp.*

Circle 31 on postcard for more data

Air Cylinders

ADDITIONS to a line of small air cylinders include a double-acting model (air-powered advance stroke, air-powered retract stroke), as well as single-acting air-powered advance, spring return units. Previously available in one-in. stroke only, both types are now offered in one, two, three and four-in. strokes.

Their compactness and mounting flexibility are said to make them suited for all types of clamping, parts positioning and ejecting, as well as light-duty tool and work feeding operations. Han-D-Air cylinders are equipped for simple, universal mounting; they may be front or side-mounted, front or rear flange-mounted, or front pivot mounted. The 5/16-in. piston rod is threaded for easy coupling to work loads. All models develop a thrust equal to the air pressure applied. *The Bellows Co.*

Circle 32 on postcard for more data

Hydraulic Accumulator

BY storing up energy during selected time of a cycle, large electric motors and electrical controls can be replaced with small, economically operated motors, according to a release announcing the Barnes hydraulic accumulator. This unit features a unique diaphragm which is only flexed, never stretched, and is said to operate indefinitely without loss of pre-charge pressure supplied by either nitrogen or air under pressure.

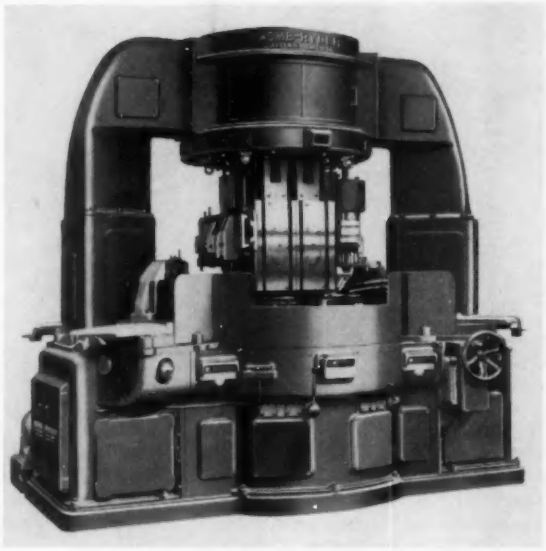
Barnes hydraulic accumulator

Stated typical applications are traversing mechanisms, indexing turrets for high speed lathes, clamping and actuating devices. *John S. Barnes Corp.*

Circle 33 on postcard for more data

Large Capacity Vertical Chuckers

FIRST of a new series of vertical multiple-spindle hydraulic chucking automatics recently introduced is an eight-spindle model equipped with 14-in. capacity chucks, eight turning slides and four cross slides. In addition, four "auto cross slides" can be operated on the vertical turret at one time to provide greater tooling adaptability for production machining of large forged and cast workpieces. A six-spindle model equipped with 17-in. capacity chucks, six vertical turning slides and four cross slides also will be available.



This 14-in. Acme-Ryder eight-spindle vertical hydraulic chucking automatic is arranged for double indexing with two loading stations

The cross slides complement the vertical end-working slides and are said to furnish flexibility and additional tooling operations heretofore not available in a single machining setup in these capacities. Because the independent cross slides of the machine are mounted on the lower frame and actuated from cam drums located directly beneath them, they reportedly give adequate support for the heaviest forming cuts as well as cross-facing or necking operations on the surface of the piece.

Machine power is designed to make use of the most modern cutting tools to best advantage, and also to provide an ample reserve to accommodate future tooling advancements. Standard spindle speed range is 32 to 628 rpm. Three spindle speeds are available at each spindle position.

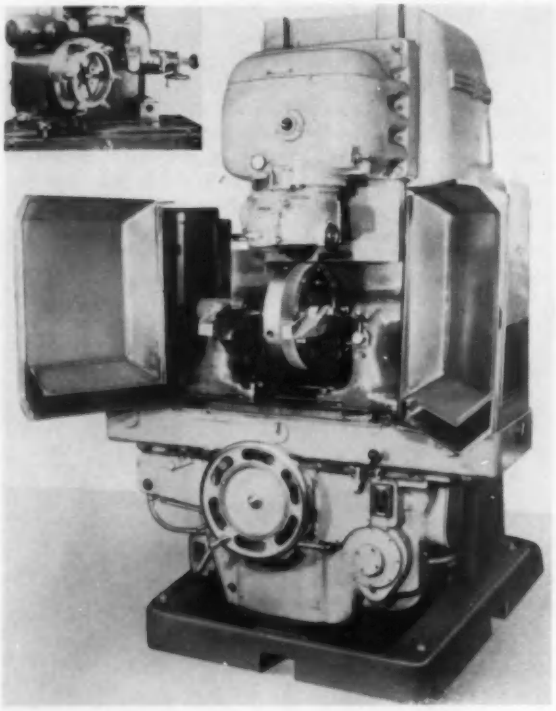
Positive indexing of the spindle carrier is by an independent indexing motor with hydraulically-operated locking and clamping at completion of index. Changeover from single to double index (or vice versa) is accomplished by the removal or addition of a cam on the indexing tappet shaft.

The electro-hydraulic system not only provides a convenient means of actuation and control, but also enables a number of electrical, hydraulic and mechanical interlocks to be embodied as safety devices to protect both machine and operator. Functions performed hydraulically include: opening and closing of chucks; engaging and disengaging clutches in the spindle drives; applying brakes at the loading stations; providing a reverse motion of the carrier to bring it back against the locating catch after indexing, then actuating a wedge to hold the carrier in that position; and clamping the carrier during cutting. Machine controls are conveniently located near the loading station and are duplicated at the rear for ease in setting up. A master timing cam drum controls the completely automatic machining cycle, operating switches for the entire electrical circuit including the electro-hydraulic circuits.

Frame design employs arch type construction supported by heavy columns to insure rigidity and permanent toolslide alignment. Access panels in the top housing, columns and base permit easy entry for adjustment and service. *The National Acme Co.*

Circle 34 on postcard for more data

Shaver for External and Internal Gears



The improved Red Ring Model GCP-24-in. gear shaver finishes external gears up to 24-in. pitch diameter. The inset shows the machine equipped to shave internal gears up to 24-in. pitch diameter.

THE improved Model GCP-24-in. Red Ring gear shaving machine, for finishing external and internal spur and helical gears up to 24-in. pitch diameter, is now available. It is equipped with loading rails that enable external gears to be loaded in and out of the machine under the shaving cutter which is above the work.

When internal gears are shaved (see inset) on the machine, swivel work head and internal cutter head attachments are provided. A hollow spindle in the work head permits the shaving of parts with integral shafts. The swivel work head enables the work to be swung out toward the operator for easy loading and unloading. Cutter on the internal cutter head is brought into mesh with the work gear and locked in one motion. The work gear drives the cutter when shaving internal gears. When set up to shave external gears, the cutter drives the work on the machine.

The machine will shave external gears from 3-in. to 24-in. pitch diameter in the 2 to 16 diametral pitch range. Internal gears from 6-in. to 24-in. pitch diameter in the same tooth size range can be shaved on the machine. Crown shaving is accomplished by the Red Ring rocking table action. It handles gears up to 28⅞ in. between centers. A 10-in. maximum table stroke can be had when straight shaving. A stroke of 6 in. is possible with crown shaving operations. *National Broach & Machine Co.*

Circle 35 on postcard for more data

Heating Station

FOR use in conjunction with control station and motor generator equipment of either 960, 3000, or 9600 cycles and ranging in power output from 30 to 300 kw, a new remote heating station is offered. It provides output flexibility for a wide variety of metal heat treating and fabricating operations such as tempering, annealing, selective hardening, normalizing, shrink fitting, stress relieving, hot forming, forging, and for brazing and soldering.

Capacitor racks provide ample mounting for a total of eight power factor correction capacitors. Water flow switches prevent operation of the remote heating station if the water pressure is inadequate to insure proper circulation of cooling water through the unit. Door interlocks remove high voltage for personnel safety when access doors are opened or panels are removed.

The all-steel cabinet is heavily constructed of angle frame and 10 gauge steel panels and conforms to JIC specifications. Dimensions are 40-in. wide by 40-in. deep by 61-in. high.

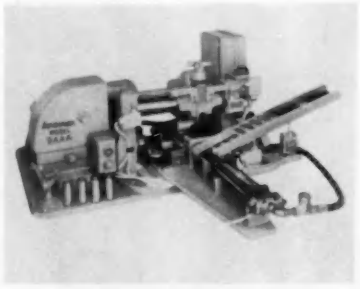
The heating station when used in conjunction with a motor generator set and the proper control station comprises a complete induction heating installation exclusive of inductors and fixtures. A complete line of auxiliary equipment, including work tables, work sinks, inductors, jigs, fixtures and automatic workhandling mechanisms, are available in different combinations to meet specific requirements. *Lindberg Engineering Co.*

Circle 36 on postcard for more data

Marking Machine

AN improved automatic motor driven marking machine that features a "jet of air" to position the work and then to eject the work after marking, is offered. It is designated as the Acromark model 9AAA with Acrojet assembly.

The machine is for marking steel parts such as bushings, collars, gages, rings, sleeves, taps, mills, drills and other cylindrical or tubular type parts. It has a seven-in. stroke and will mark parts up to two-in. diam in the standard machine, or larger when the oversize frame is used. Standard



Acrojet marking machine

operating speed is 36 strokes per minute, but this can be altered by a single gearing change when easily fed small parts are to be marked.

Fully automatic operation is provided. When the chute feed is lined up with a conveyor to bring the work to the machine, each part is moved forward into marking position by the Acrojet as it reaches the bottom of the chute. After marking, the Acrojet ejects the marked part onto a "carry-away" conveyor and automatically positions the next part. *The Acromark Co.*

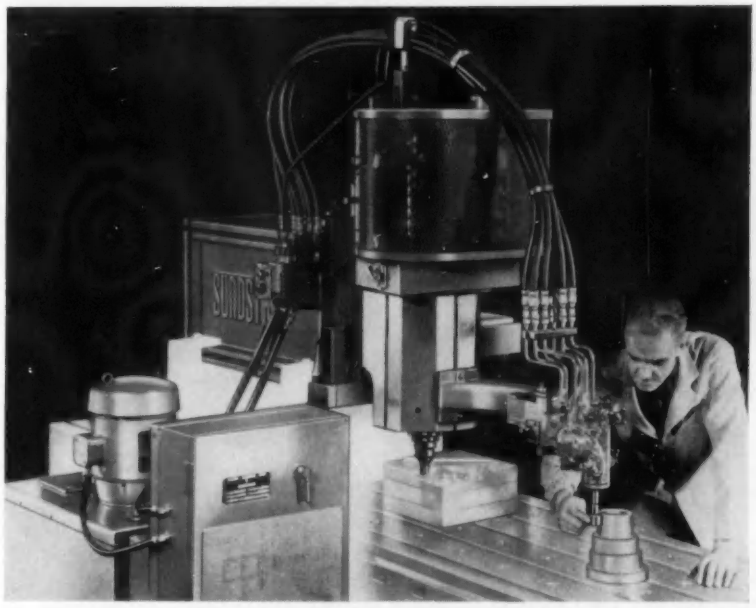
Circle 37 on postcard for more data

Three Dimensional Tracer Milling Unit

A THREE dimensional tracer milling unit, with a ram support having transverse and longitudinal keyways with suitable mounting provisions on all four sides and the end, has been introduced. The tracer stylus arm also has several manual mounting positions to further increase the possible uses of the unit. This arrangement makes it practical to take numerous cuts on large work pieces by moving the cutter rather than the work piece itself.

The transverse and longitudinal movements of the cutter are 12 in., with the depth movement being 8 in. All three movements are manually controlled from a single pencil type stylus tracing unit to enable duplication of patterns on the work pieces. Each movement has a quick shut-off valve for independent use of any one movement. The cutter head slide has a micrometer screw depth stop for accurate depth location for the full range of cutter travel. The linear and depth duplicating speed of the cutter is variable within a range of 1 to 50 ipm.

The stylus has a positive lock adjustment on all three movements to enable the locating of the cutter in relation to the stylus on the template. To allow for the changing of various size tracing stylus without changing the cutter, a quick change positive lock stylus chuck has been provided.



The Sundstrand three dimensional tracer milling unit illustrated has a belt-driven three-hp head with four possible speed changes.

The unit shown has a belt driven three-hp head with four possible speed changes of 200, 400, 900 and 1800 rpm. Also available is a three-hp head with infinitely variable speeds between the range of 200 to 1800 rpm. In addition, five-hp heads of either the four speed belt driven type or the infinitely variable speed type can be furnished. *Sundstrand Machine Tool Co.*

Circle 38 on postcard for more data

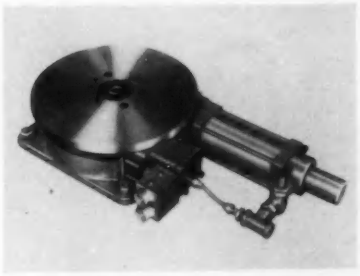
Rotary Index Table

BUILT-IN automatic switch actuators are an optional feature in the air-powered rotary index table just announced. The actuating rods and switches control the main work operation, the positive locking of the table itself, and related movements such as work holding devices, feeders, etc.

This new Accro-Dex table has a 12-in. diam, ¾-in. thick steel table top supported by a wide lubricated peripheral bearing near the edge. Without disturbing the table top, it can be set to provide 4, 6, 8, 12, or 24 stations. It can operate up to 150 index movements per minute (at 24-station setting).

Over-ride or skipping of stations is reportedly impossible as the index cylinder piston seats against the cylinder head at the completion of any index movement. Loads up to 500 lb can be carried without jarring due to an adjustable air cushion device at the head of the index cylinder.

A locking wedge actuated by a separate air cylinder provides repetitive stops within 0.002-in. (at edge of table). A ⅝-in. ID access hole is provided in the Timken roller bearing equipped center post to permit passage of piping or wiring to the table top. Hydraulic-powered models are also available. *General Automation Products Co.*



Accro-Dex rotary index table

Circle 39 on postcard for more data

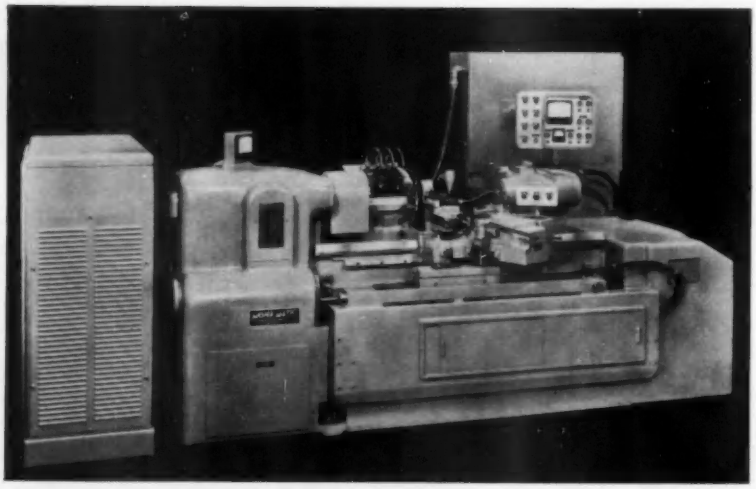
Barrel Finishing Media

A NEW barrel finishing media, conical ceramic shapes, has been announced. Called "Honite" brand Ceramicones, the media is claimed to make it possible to barrel finish intricate parts which previously could not be finished in this manner because of lodging problems. The tapered ends permit access to holes for deburring, yet the broad bases prevent lodging; and their resistance to wear maintains original dimensions over long periods, according to the company.

The media will reportedly also remove burrs and parting lines from molded plastic parts without scratching the fine surface produced in molding. Danger of contamination is minimized because the ceramic material is fused under high pressure to eliminate voids and resist deteriorating effects of acids. The cones are ½-in. high, ⅜-in. through the base and 7/32-in. across the top. *Minnesota Mining and Manufacturing Co.*

Circle 40 on postcard for more data

NEW PRODUCTION and PLANT EQUIPMENT



Model 21 Mona-Matic manufacturing lathe equipped with new constant surface cutting speed mechanism offered by The Monarch Machine Tool Co. Electrical control equipment of the mechanism is housed in the separate cabinet enclosure shown at the headstock end of the machine

Constant Surface Cutting Speed

CONSTANT surface cutting speed mechanism for the recently announced model 21 Mona-Matic manufacturing lathe is now offered. Functioning in conjunction with the multicycle programer controlled four cut fully automatic work cycle of the model 21, the new mechanism is said to provide automatic variation of drive motor speed to maintain the desired surface cutting speed on each of the various diameters and contours of each workpiece in the run. According to the firm's engineers, this new speed control feature gives increased tool life, higher rates of production, and improved workpiece finishes.

During operation when the multicycle programer of the lathe indexes from one cutting cycle to the next, causing the cutting tool to be automatically positioned for the required cut, an electrical signal indicating the distance from the cutting tool tip to the workpiece centerline is transmitted to the constant surface cutting speed mechanism. This mechanism then automatically adjusts the machine's drive motor speed and, as a result, the spindle rpm, to produce the desired surface cutting speed on the workpiece. If during the actual cut, the drive motor deviates from the proper speed, a special feedback signal system enables the control to compensate for the error.

When contours are turned under control of the air gage tracer unit of the machine, the constant surface cutting speed mechanism continually varies the drive motor speed, to automatically maintain the required surface speed at the point the tool tip is actually cutting. If desired, however, the mechanism can be controlled manually.

The main drive motor of the lathe is a 25 hp variable speed ac unit. Available surface speeds range from 200 to 1175 fpm and can be maintained over a 4 to 1 diameter range. *Monarch Machine Tool Co.*

Circle 41 on postcard for more data

Key Type Cylinders

THE development and production of an improved key type hydraulic cylinder, with a number of features which make it desirable from an application and service standpoint, has been announced.

The meehanite rod bearing is long, providing a full one to one surface for extra wear. Chevron type packing can be easily replaced, and the whole bearing insert is held by inserting a locking snap ring at the rod end. Cast steel mounts are standard equipment and are an integral unit combined with the head and rod caps of the cylinder. These head and mount combinations may be disassembled by removing the internal locking key ring which unites the head and cylinder wall. There are no bolts used in the construction. This design is said to permit the cylinders to be small in diameter and length at no sacrifice in strength.

Heavy wall tubing, chrome-plated rods, rod scraper and milled wrench flats on rods are standard in all cylinders. The cylinder heads are locked in place in a counter-bored section of the tubing wall at the ends of the cylinder. Pipe ports can be oriented at random due to the 360° rotation of the ends which is made possible by the key type construction.

Carter hydraulic cylinder

Sizes available are 1½-in. through 8-in. bores, with a stroke of any length up to 18 ft. *Carter Controls, Inc.*

Circle 42 on postcard for more data

Degreaser

A NEW compact vapor spray degreaser features unique circular construction and unobstructed tank walls with recessed condensate trough for effective solvent reclamation. This trough serves as a reservoir for distilled, pure solvent which is fed by means of a corrosion-resistant pump to a flexible hose and spray lance with fan-type nozzle.

Interior of the standard tank, as well as other critical surfaces, are zinc metallized for protection against corrosion. Stainless clad steel construction is available. Other advantages include easily removable, sturdy work rest; comfortable work height and removable cleanout door. All seams are electric arc welded and exteriors are painted in solvent resistant machinery gray.

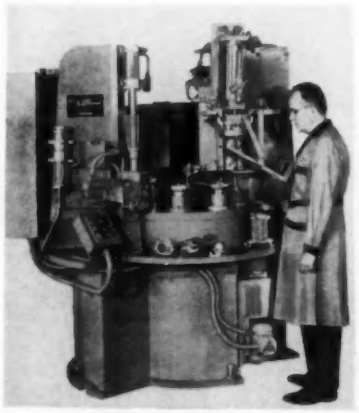
The OP2-D30 economy model degreaser is available with steam or electric heating systems. *Circo Equipment Co.*

Circle 43 on postcard for more data

Automatic Assembly

FEEDING, positioning, assembling and removal of parts are all done automatically by this eight-station assembly machine recently designed and manufactured. The parts consist of a needle bearing, a washer and a seal which are assembled in an automotive steering gear end cover. Parts are automatically fed and positioned from indexing magazines, while the completed assembly is removed and placed on a conveyor automatically. Production rate is 720 completed assemblies per hour.

A specially designed panel with plug-in aircraft-type relays controls



Robbins automatic assembly machine

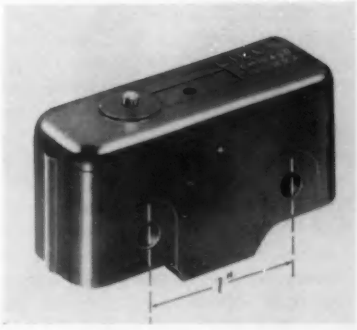
the electrical circuit. Included in this panel with the operating relays are controls which prevent assembly unless each of the component parts is correctly positioned.

The index table uses both a barrel-type cam and a shot bolt for accuracy, and is operated through a magnetic clutch and brake which provide a one-sec index and a four-sec dwell. Dwell time is controlled by a synchronous timer and electrical interlocks at each station. *Omer E. Robbins Co.*

Circle 44 on postcard for more data

Sensitive Switch

THE Licon (R) Type-10 switch offers movement differential less than 0.0005-in., for use in operations requiring extreme sensitivity, and the exclusive "serpentine" snap action of the switch is said to consistently give more than 10,000,000 actuations in tests. The manufacturer states the switch mechanism largely eliminates the problem of switch fatigue, and assures positive actuation of

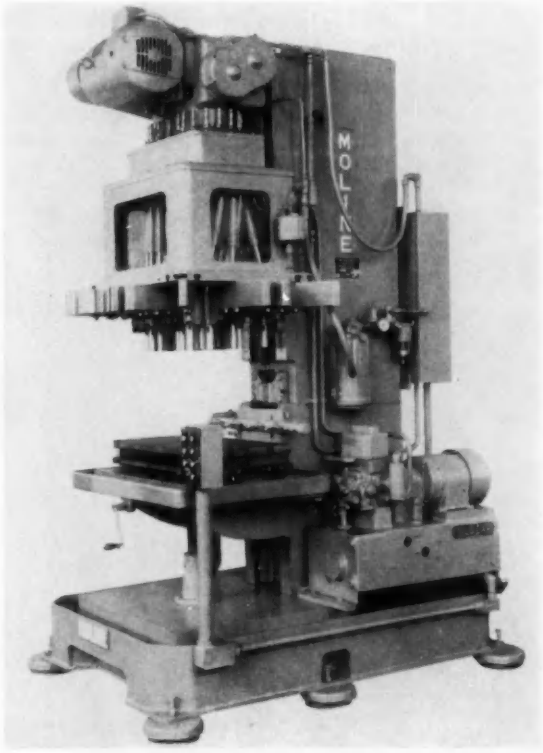


Licon (R) Type-10 switch

equipment. Since the switch has no pivot points it has no dead center, no flickering. The low stress design eliminates drift at the trip points.

The Type-10 has a 20 amp rating, and the manufacturer says it is particularly adaptable to use in machine tools, appliances, aircraft and in-plant uses. Seven different types of plunger, spring and lever actuators are available. Illustrated is the pin plunger, made of polished stainless steel. *Licon (R) Switch and Control Div., Illinois Tool Works.*

Circle 46 on postcard for more data



Moline HU110 universal joint type driller. Hydraulic rail feed with 18-in. max. slide travel; 16-in. width flat ways; 42-in. slide length; 24 adjustable center spindles with 1-in. drill capacity in steel and 1¾-in. minimum centers; 24 by 36-in. work table with 12-in. vertical adjustment; 10 hp spindle drive and 3 hp hydraulic pump drive.

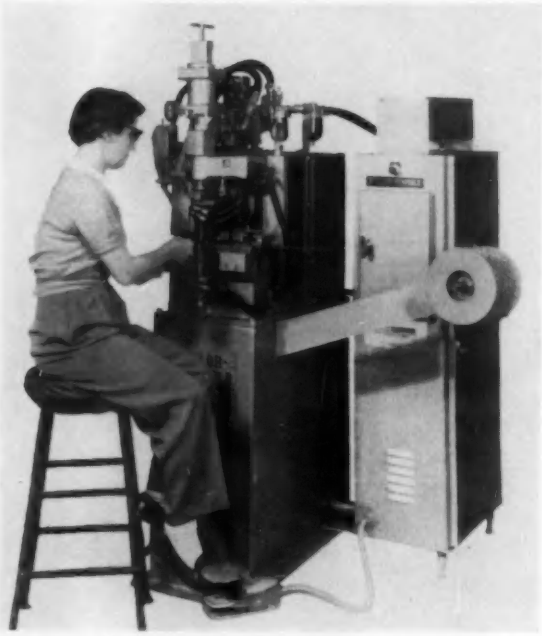
Multiple Spindle Driller

THE model HU 110 universal joint type, adjustable spindle, hydraulic feed drilling machine has two-speed-and-neutral adjustment for each spindle driver. The spindle drivers are designed for easy installation or removal in that each driver assembly is made up as a unit including speed adjusting mechanism, anti-friction bearings and driven gear. The entire spindle unit which moves on vertical ways, also is suitable for use as a horizontal unit or for any intermediate angle with no design changes. Thus, the unit is adaptable for use in making up rather versatile way type drilling equipment.

The machine has a 15 by 24-in. drilling area and can be equipped with a maximum of 24 two-speed-and-neutral spindle drivers. Feed cycle is automatic with electric push button control. *Moline Tool Co.*

Circle 45 on postcard for more data

Automatic Multi-Operation Welder



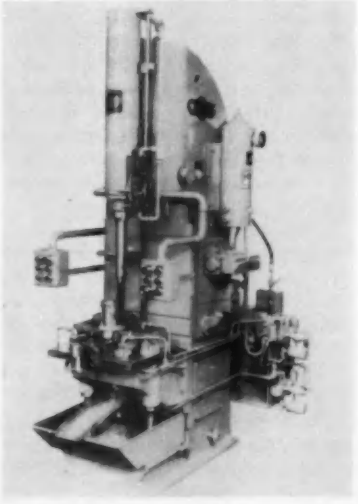
The welder illustrated is joining electrical terminals to wires. The terminals are fed in strip form, then welded and staked to the wires. The use of resistance welding insures a good electrical bond. Heat time is short to permit use of plastic covered wire without damage to the cover. Feeding of terminals in strip form and addition of a cut-off shear results in high production rate. All three operations, welding, staking and cut-off are done automatically as the welder indexes the product through the several stations. (Taylor-Winfield Corp.)

Circle 47 on postcard for more data

Horning Type Press Broaches

THIS hydraulic Horning type press with continuous automatic cycle broaches 30 external involute gear teeth on the OD. of a bronze automotive synchronizer ring.

The broaches for this machine are mounted in a stationary broach pot, through which the part is pushed. Ten H.S.S. 30 involute spline broach rings are mounted in the pot. The pot also acts as a guide for the push bar during the broaching stroke. An air operated automatic slide, interlocked to the machine cycle, carries the parts from the tube feed to broaching position over the broach pot. Stripping fingers and an ejection device automatically strip and eject the part below the pot. The parts are fed to the slide by a gravity tube feed. A single spline inside the tube radially locates the notched parts.



American Horning type press

With the machine running on continuous automatic cycle, the operator only has to keep the magazine feeding the slide filled with parts. Parts are placed in the tube feed indexed by the spline. The slide picks up a part from the tube and moves it into broaching position. The ram moves the push bar down, pushing the part through the broach pot, broaching 30 involute gear teeth on the OD. At the end of the broaching stroke, the stripper fingers move in between the part and broach pot, stripping the part from the push bar which is returned by the ram. A plunger then moves out, ejecting the part down the discharge chute.

At a theoretical 100 per cent efficiency, production is about 300 parts per hour. *American Broach & Machine Co.*

Circle 48 on postcard for more data

Power Screw Driver

THE new Model 400 power screw driver can be operator-controlled for certain work, and then converted to fully automatic operation when required. In a fully automated operation, it is able to replace all of the operator's functions, including feeding and guiding, controlling the length of the stroke, and automatically maintaining a pre-determined torque. Several of the machines can be set up to do multiple fastening jobs with only one operator controlling the entire battery.

When used with an operator in attendance, the unit has features that increase efficiency. The work table can be raised or lowered on the double steel posts. Since the machine is treadle operated, both of the operator's hands are free for positioning the work. Where piece work is required, the machine eliminates individual screw handling and protects the product from assembly damage. The driving unit is detachable, for use where space is limited or where center distance between screws is close.

Shakeproof Model 400 power screw driver

The new driver can drive as many as 60 screws per minute. The manufacturer states the machine is also adaptable to many unusual operations. An example of this is running screws only part way in, so that wire or other parts can be attached in a later stage of assembly. *Shakeproof Div., Illinois Tool Works.*

Circle 49 on postcard for more data

Magnetic Inspection

A MAGNETIC particle inspection device that requires no electrical power is now available. This portable Magnaflux YM-5 Yoke Kit is said to reliably find cracks in magnetic parts or members. Since electric arcing is impossible, the device makes practical the inspection of critical parts or welds in hazardous areas. It eliminates the need for disassembly, heavy equipment, and electric power, and increases the efficiency of regular inspections.

The kit comes complete with a metal storage and carrying case, and total kit weight is only 22 lb. The yoke legs are hinged and the angle-cut tips rotate so that good magnetic contact can be made on almost any shape part. The permanent magnet elements are Alnico, and the company has developed a new magnetic circuit which gives the unit an effective magnetizing power for its weight. The magnetic pull is over 40 lb on a flat surface, while the yoke itself weighs just five lb.

A spray gun, two powder bulbs, and wet-bath and dry powder magnetic particle materials are also included in the kit. *Magnaflux Corp.*

Circle 50 on postcard for more data

Air Grinder

NOW in production is a new air grinder, designated model 5V, which has been completely redesigned from its one-piece housing to a newly developed air motor which is said to

Thor air grinder

rate the machine at 50 per cent higher power. This model replaces the company's 250-D air grinder.

It is being made available in speeds of 4500, 6000, and 8000 rpm and features an adjustable, positive-speed governor for increasing air economy and assuring safety under operating conditions. A built-in exhaust muffler effectively reduces noise levels.

An important design feature cited is that grip handles on the 5V are spaced 110-deg apart, rather than at the conventional 90-deg, which the firm's engineers believe will heighten operator convenience and increase efficiency. Other features include automatic mist oiling from a large-capacity reservoir, double-row, preloaded spindle bearings and hardened steel center plates.

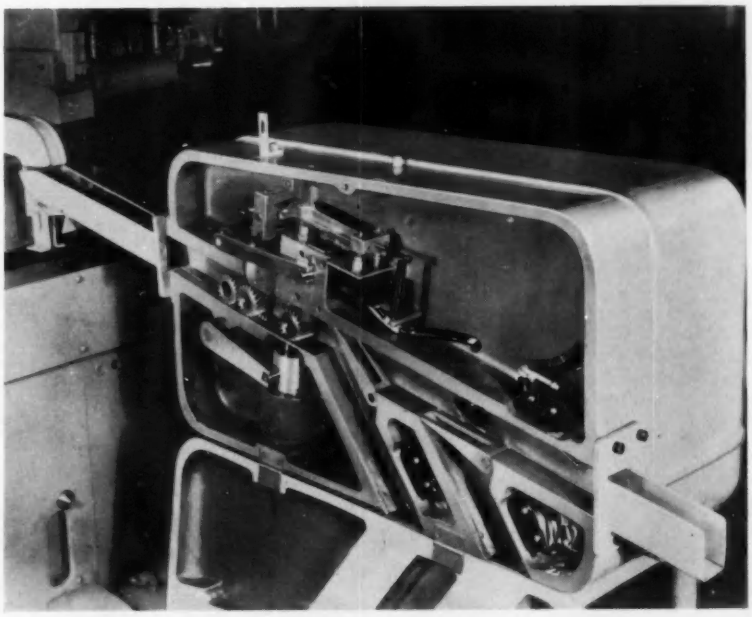
Extra equipment and accessories offered, convert the tool from a vertical cup grinder to a sander, wire brush machine or depressed center, disk-wheel cut-off grinder. Available guards will include a compact rotating unit, an open-end cup wheel guard, and a unit for cut-off wheels. *Thor Power Tool Co.*

Circle 52 on postcard for more data

Probe Type Gear Classifier

AN automatic, probe-type, gear size monitoring system has been added to the 3-Way gear classifier line. It has a gear gaging action based on point contact of individual probes, while other models use master gears. The new unit is said to be particularly suitable where gears go directly to the classifier before passing through a washer. The probe-type system, two lower stationary probes and one upper floating probe, that senses full production from a single machine or a bank of gear producing machines. Both a visual and electrical check of production accuracy is provided within the specified tolerances of the gear pitch diameter.

In operation, gears enter the classifier from the side and continue down



Michigan Tool probe-type, 3-Way gear classifier with front cover removed. Gears enter from the left, are checked by probes as shown and then proceed down chute. Satisfactory gears go all the way through. Oversize or undersize gears are dropped into proper chute and exit from the bottom of the classifier.

model is readily adaptable to the Gear-O-Mation system for automation of the gear production line.

Oversize, undersize, and correct-size gears produced on hobbers, shapers, shavers, or shear-speed machines are monitored automatically using the pitch diameter as a reference base. This model has a three-point contact the inclined ramp through the probe-sizing operation. Gears within specified tolerances continue through the classifier to the next operation. Any oversize or undersize gears are automatically shunted aside and collected separately for salvage or scrap. *Michigan Tool Co.*

Circle 51 on postcard for more data

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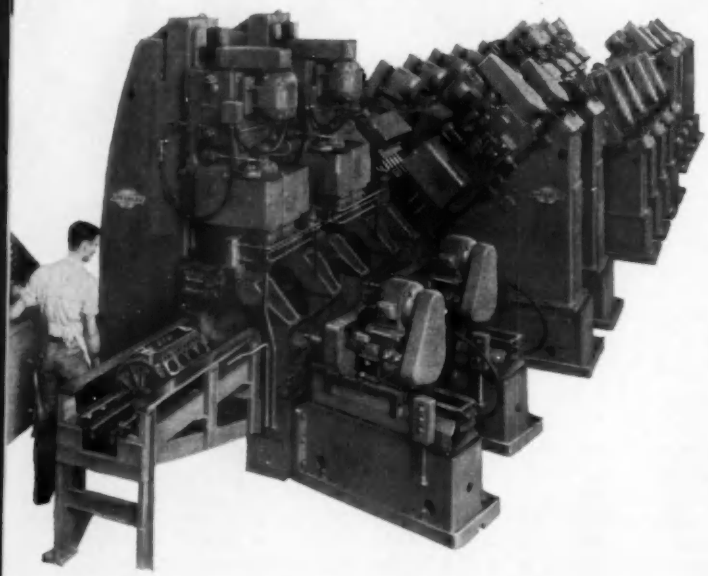

New, Enlarged Production Facilities Speed Delivery of Greenlee

TRANSFER MACHINES

Pictured is one of four Greenlee assembly floors. This newly constructed, block-long building covers almost two acres of ground . . . provides a well-lighted, roomy area for erecting and testing Greenlee Transfer Machines similar to the ones illustrated.

This 17-Station Greenlee Transfer Machine, the first in a line of three . . . carries 152 tools. It automatically drills, countersinks, cleans and gauges holes in V-8 cylinder blocks. Take advantage of Greenlee's specialized assistance in planning for automatic production. Write or wire today for a consultation.

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FREE LITERATURE

Gear Motors 1

Described in bulletin E-2408 is a line of gearmotors incorporating new NEMA motors and redesigned gearheads. *Reliance Electric & Engineering Co.*

Separators 2

Technical sheet is available on a new principle of separation using a flat magnetic field instead of the conventional drum normally used in magnetic separators. Liquid flow is on top of the magnets and gravity action assists the magnets in attracting ferrous particles and sludge from the liquids. *Industrial Filtration Co.*

Transducers 3

Fully illustrated booklet entitled "Design of Nickel Magnetostriction Transducers," summarizing practical experiments to guide the engineer toward workable designs, is available from *The International Nickel Co.*

Perforated Materials 4

General catalog 62, 128-pages, illustrates hundreds of different standard patterns of perforated materials. *Harrington & King Perforating Co.*

Extrusions 5

A comprehensive 24-page booklet covering heavy press extrusions is now available from *Kaiser Aluminum & Chemical Sales, Inc.*

Air Control Valves 6

A four-page illustrated guide presents 17 lines of air-control valves and accessories. *Airmatic Valve Co.*

Punches 7

Unitized hole punching and notching equipment are described and illustrated in new catalog. *Punch Products Corp.*

Fuel Gages 8

Capacitor type fuel gages and controls, including true weight gaging systems, compensated and uncompensated capacity type fuel gages, repeat indicators, fuel gage totalizing systems, selective indicators and thermistor applications for fuel level warning and control, are covered in Bulletin 546. *Liquidometer Corp.*

Selenium Rectifiers 9

Bulletin ER-107, 12-pages, describes and illustrates selenium rectifiers for electroplating, anodizing and related processing. *Hanson-Van Winkle-Munning Co.*

Degreasers 10

A basic line of degreasers for metal cleaning is presented in four-page condensed catalog 521. Units covered are vapor phase, vapor spray, liquid vapor, pit type and mechanized models. *Circo Equipment Co.*

(Please turn page)

VOID After June 1, 1956 **4/1/56**

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Steel Strapping 11

Catalog No. 2 contains technical data on a complete line of round and flat steel strapping material, equipment and accessories, and also includes typical applications. Thirty-six pages. *Gerard Steel Strapping Div., U. S. Steel Corp.*

Multi-Cycle Lathe 12

The Model 14 multi-cycle single-point production lathe, having an automatic cycle for roughing and finishing, is described in six-page bulletin No. 14-1, issued by *Sundstrand Machine Tool Co.*

Gear Drives 13

Sixteen-page book 2651 on its new series of in-line helical gear drives, including load classes for over 250 applications, has been issued by *Link-Belt Co.*

Plastic Pipe 14

Technical bulletin 80-3 gives engineering data on Ryertex-Omicron PVC (polyvinyl chloride) plastic pipe which is said to defy attack by industrial chemicals. *Joseph T. Ryerson & Son, Inc.*

Honeycomb Shaping 15

Bulletin 156 describes a new process for electrolytically shaping honeycomb materials that reduces abrasive action 90 per cent and is said to produce clean, sharp cell edges. *Anocut Engineering Co.*

USE THIS POSTCARD

Seam Welder 16

The MP1 air-operated, press type, single-phase seam welder, designed for a wide range of commercial welding applications, is fully described in six-page bulletin 316-7. It also explains "mash welding," a resistance seam welding technique used to fasten the edges of a smooth weld with the near thickness of one sheet. *Sciaky Bros., Inc.*

Hydraulic Machines 17

A complete line of hydraulic machines is described in 24-page bulletin 110-D, including information on injection, compression, and transfer molding machines for the plastics industry; extrusion presses for ferrous and non-ferrous metals; metal-working equipment; and machinery for general industrial applications. *Watson - Stillman Press Div., Farrel-Birmingham Co., Inc.*

Hose Clamps 18

Three basic types of stainless steel hose clamps used in the aviation industry are covered in a four-page folder, form AH-156, which also includes detail drawings of the clamps, size charts, and AN737 equivalents, if any. *Wittek Mfg. Co.*

Ceramic Terminals 19

Bulletin 1055, two pages, describes a new line of annuluted-type terminals which are engineered of high alumina ceramics and metallized with Nicote and which are said to withstand continuous immersion in lead-tin solder at 500 F. *Frenchtown Porcelain Co.*

Product Data 20

Torque converters, radiators, clutches, oil coolers, heat exchanger coils and air conditioning components are among items shown in a 20-page product booklet made available by *Long Manufacturing Div., Borg - Warner Corp.*

Fork Trucks 21

Details of Models ESRT 20 and ESRT 40 electric fork trucks are given in two four-page bulletins. Both models feature a telescopic retractable mast and a balanced action which automatically equalizes the load on both wheels regardless of floor irregularities. *Automatic Transportation Co.*

Adhesives, Sealers 22

Properties and applications of a wide variety of adhesives, coatings, and sealers are listed in tabular form in 12-page illustrated booklet published by *Adhesives and Coatings Div., Minnesota Mining & Mfg. Co.*

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NEW PRODUCTS
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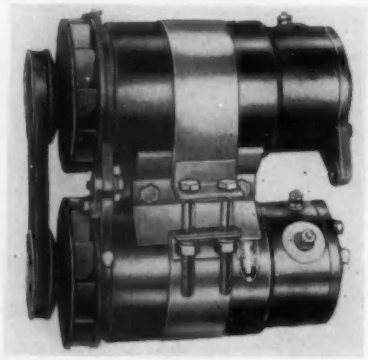
FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Auxiliary Generator

"Piggy back" generators are proposed as a low cost method of obtaining extra electrical power for taxis, police cars, light delivery trucks, cars equipped with "ham" radio or radio telephone service, and other vehicles



where charging at low speed is desirable. A 6-v generator is mounted "piggy back" with a 12-v original equipment generator to permit operation of a separate 6-v system for radios, sirens, flasher-lights, and other emergency units on vehicles equipped with a 12-v electrical system. Two 12-v, or two 6-v generators are teamed in the same fashion to provide more low-speed or idle-speed output for vehicles which do excessive slow-speed driving. *Delco-Remy Div., General Motors Corp.*

Circle 60 on postcard for more data

Zytel Fittings

Tube fittings, which consist of two parts, require no flaring of the tube and permit re-use of tubing, are being made from Zytel nylon resin, according to an announcement. Simplification is said to be accomplished by incorporating the compression section as an integral part of the nut. The fittings, which can be used with any type of tubing, metal or plastic, are available for tubing with OD ranging from ¼ through ½-in. Pipe sizes run from ⅛ to ½ in.

The design of these fittings does not require tubes cut to exact lengths. Leak-proof connections reportedly can be made without indenting or necking the tubing. *Jaco Manufacturing Co.*

Circle 61 on postcard for more data

Hard Steel Bars

Long, round, hardened bars, for use as guide rods, shafts, rolls, piston rods, axles, etc., are now obtainable in a new type of industrial material designated "60 Case." The material is AISI 1060 steel, which has a surface hardness close to 60 R_c, and it is precision ground to standard diameters. Pointing out that long, round parts with a hard wear surface have been a fabrication problem primarily because conventional heat treating causes warpage, it is stated that these can economically be furnished from the new material.

Initial standard sizes range from a nominal diameter of ¼ to 4-in. The maximum length varies from 8 to 14 ft depending on the diameter. The depth of hardness ranges from 0.040-in. minimum in the smallest diameter to 0.100-in minimum in the largest diameter. *Thomson Industries, Inc.*

Circle 62 on postcard for more data

Snap-In Resistor

The Type LR-70 control is a self-supporting, snap-in variable resistor for printed wiring. It measures only 57/64-in. diam and stands ⅞-in. off the mounting board. It is supported by four legs, the three regular voltage taps, and a larger, case ground leg. No mounting hardware is required since the legs merely snap into the printed wiring board to form a strong support.

Single or double-pole snap switches are available with ratings from 15-amp, 15-v dc to 6-amp at 125-v ac-dc. The LR-70 is rated at 0.75-w for values above 10,000 ohms, and 0.50-w below 10,000 ohms. *Electric Component Div., Stackpole Carbon Co.*

Circle 63 on postcard for more data

Spun Aluminum

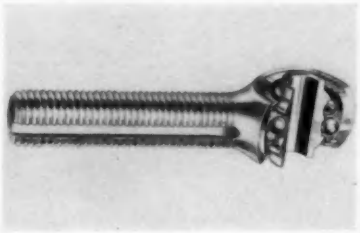
A spun aluminum process is said to make possible substitution of the cheaper metal in such automotive integrals as overflow and vent tubes, and other similar parts, as well as where a venturi effect is required, as in carburetors. With the new process, aluminum flows into position rather than being abruptly displaced. The method also enables spun parts to be held to close tolerances without costly machining where this is necessary for the precision performance of an operating mechanism.

Spinning aluminum in offset results in a formed end located anywhere off-center of the part being formed, without the necessity for kinking or bending operations. It applies to the "necked end" as well as to the inlet or outlet tubes connecting to the component. *Whiting Tubular Products, Inc.*

Circle 64 on postcard for more data

Rod End Bearings

A new series of rod end control bearings for aircraft comes in five sizes with every member of the series designed so that bearing capacity, shank strength and bolt strength are in balance. The series consists of

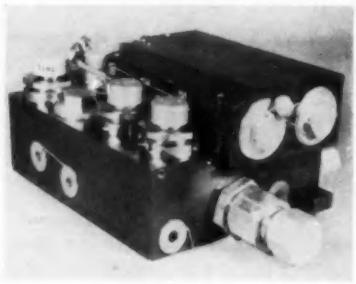


standard sizes which meet a wide range of requirements for anti-friction rod ends. The two ball bearing rod ends with high strength shanks are designed primarily for manually operated control systems. Three high capacity roller bearing rod ends are for power-operated flight control systems. *Fafnir Bearing Co.*

Circle 65 on postcard for more data

Selector Valves

A new line of constant gain solenoid selector valves for aircraft oil-hydraulic systems, featuring a "packaged" design of seven-units-in-one, is now available. They are basically four-way, closed center solenoid selector valves with modifications suiting them for oil-hydraulic systems utilizing an on-off (contactor) type servo-mech-



anism control. They are designed for high pressure, high temperature installations requiring two-way actuation of controls at two different rates of response, such as the control of a turbo-jet variable exhaust nozzle. Operation of the valve is governed by 28v dc electrical input signals provided by the engine speed control or other system requiring electrical input.

The unit contains within a single housing a restrictor and by-pass valve arrangement, a pressure relief valve, two thermal relief valves, a pressure switch, an electrical solenoid-operated shut-off valve and a check valve. These valves are recommended by the maker for use with system operating pressures up to 4500 psi, ambient air temperatures up to 350 F, system-fluid temperatures up to 300 F, and return-fluid temperatures up to 400 F. *Vickers Inc.*

Circle 66 on postcard for more data

Honeycomb Adhesives

Two new resin-type thermosetting adhesives for honeycomb sandwich construction are now available. Designated as EC-1177 and EC-1415, they can be used for bonding phenolic impregnated kraft paper honeycomb to thin aluminum, stainless steel, or magnesium sheeting.

To fabricate a honeycomb panel with adhesives, the metal is first chemically cleaned and thoroughly dried. Then the adhesive is sprayed on the metal sheet to a 0.007-in. thickness, and on the faying edges of the honeycomb core section to a thickness of 0.015-in. Following a 30-minute drying period, the coated metal sheets and honeycomb core are put in an oven and dried for 10 minutes at 190F. After removal from the oven and cooling, the sheets and core are mated and the panel placed in a press under approximately 15 psi for a maximum of 15 minutes at 300F. Excess adhesive can be removed with alcohol.

Tests on honeycomb sandwiches bonded with these adhesives indicate they have a high tensile strength, resistance to temperature and humidity extremes.

The EC-1177 adhesive is transparent, has a synthetic resin base and a heavy syrup consistency. It weighs about 7.7 lb per gal and is diluted with an equal volume of acetone for spraying.

The EC-1415 adhesive has a transparent amber color, a synthetic resin base and a medium syrup consistency. It weighs about 7.4 lb per gal and can be sprayed as received. *Minnesota Mining and Manufacturing Co.*

Circle 67 on postcard for more data

Power Converter

Conversion of 200-v, 400-cycle, three-phase ac to 26-v dc is provided by the new type 3-134 power supply. The unit is designed to permit operation of dc type CEC oscillographs in airplanes equipped with ac systems. It may also be used to power other dc equipment. Output is regulated within a 23.5 to 28.5-v dc range for line voltages from 190 to 210 v, frequencies from 380 to 420 cps and loads from 3

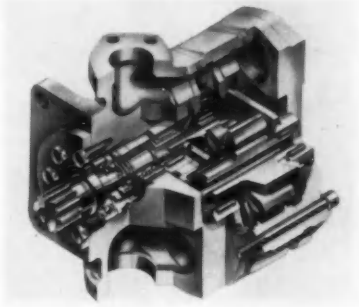
to 20 amp. Continuous-duty rating is 13 amp, or 20 amp at 25 pct duty cycle for five minutes. Peak load surges up to 50 amp will not damage the unit. Ripple factor is 0.08.

Environmental specifications provide for operation in temperatures ranging from −65 to +150F, relative humidity to 95 pct, and altitudes up to 50,000 ft. *Consolidated Electrodynamics Corp.*

Circle 68 on postcard for more data

Hydraulic Pumps

A new series of hydraulic pumps for heavy mobile and industrial equipment has been developed. Pumps in the 3600 series are engineered for in-



stallations where space is limited and where adverse conditions exist. They will deliver 65-90-110 gpm at 1200 rpm, depending on the model. Speeds range to 2000 rpm; pressures to 1500 psi, and fluid horsepower to 150 hp. Companion control valves have also been designed for these units.

The high capacity of the new series is said to make it possible for designers to consider hydraulic operation and control for larger equipment. *Hydreco Div., New York Air Brake Co.*

Circle 69 on postcard for more data

Friction Materials

Friction materials of woven asbestos fiber impregnated with various oils and resins have been developed for use in oil-cooled power transmission equipment such as clutches, torque converters, power take-offs, steering clutches and brakes. The new series does not contain metallic particles so that danger of clogging small ports in the oil system with metal particles is eliminated. The material is designed to be bonded to metal plates with thermosetting resins and assembled in oil-cooled units alternately with metal pressure plates. Either the friction material alone cut to the required size or bonded to the plates can be furnished.

Action of oil-cooled units using the material, it is claimed, is smoother because of the cushioning effect of the woven fabric. Also, because of the pores inherent in woven fabrics, faster wiping action is said to be promoted, resulting in faster positive engagement of the elements. It is available in rings, bands and cores. *Friction Div., Thermoid Co.*

Circle 70 on postcard for more data

METALS

Demand Continues for Plate and Structural Steel. Copper Price to Hold, Nickel Scarce with Black Market Prices High

By William F. Boericke

Tin Plate Advanced

The five per cent increase in the price of tinplate, announced in mid-March, to take effect in April and continue for a six-month period, was more than the can makers expected and brought out some vigorous protests. Tinplate accounts for about eight per cent of steel shipments and is priced on a semi-annual contract basis. Consequently the price can't be changed when the steel companies raise their prices across the board after the steel labor settlement in July.

Plans to effect an interim increase in steel prices before the summer labor negotiations appear to be deferred. It's bad psychology at this time. True enough, some selective increases have been made, mostly on extra charges, that may average about $1 per ton or about 1.6 per cent since November. But these are a far cry from the substantial price hikes so glibly forecast in January.

Overall Steel Demand Still Strong

No doubt steel producers privately realize that the all-out demand for steel has lost a little steam since the first of the year. It's still amazingly good, but it's unbalanced to some degree. The cutback by the automobile industry has affected buying of cold rolled sheets and strip. Supply has also notably improved in hot rolled sheets, bars, and galvanized sheets—there may be some over capacity in this line, in which producers are now able to produce 25 per cent more than last year. It has been estimated that inventories of sheets and bars, which were on almost a day-to-day basis a few months ago, are now on a normal 30-45 days for most companies.

Plates and Structurals Very Scarce

On the other hand, plate and structurals are in the strongest demand, and hard pressed users have had to turn to costly conversion deals to get delivery. The construction industry is literally famishing for supplies. Some major projects are being held up for long periods waiting for fabricated structural steel. As the weather improves, it appears improbable that shortages will improve when the construction season gets into full swing. And the big expansion plans for many steel producers force them to compete with their own customers for structurals.

Freight Car Builders Short of Steel

It is by no means easy to divert completely semi-finished shapes from sheet mills to other finishing facilities. Nevertheless some mills are trying to change their product-mix to take advantage of the pressing demand for plates. Besides the call from the construction industry, the backlog of orders for heavy plates for freight car building continues to mount. It is reported that the railroads are waiting delivery of over 147,000 cars that were ordered last year. As about 18 tons of steel is needed for every freight car, over 2.6 million tons of steel are required just for the orders in hand. The steel industry and the car builders are trying to increase the monthly output of freight cars to 6000 but this does little more than to replace those that are sent to the junk yard in the same period. Strongest factor in the call for more cars is the coal industry which is looking for another big year. And just around the corner are the shippers of iron ore, who expect to send a record tonnage to the steel mills.

Steel Inventories Increase Moderately

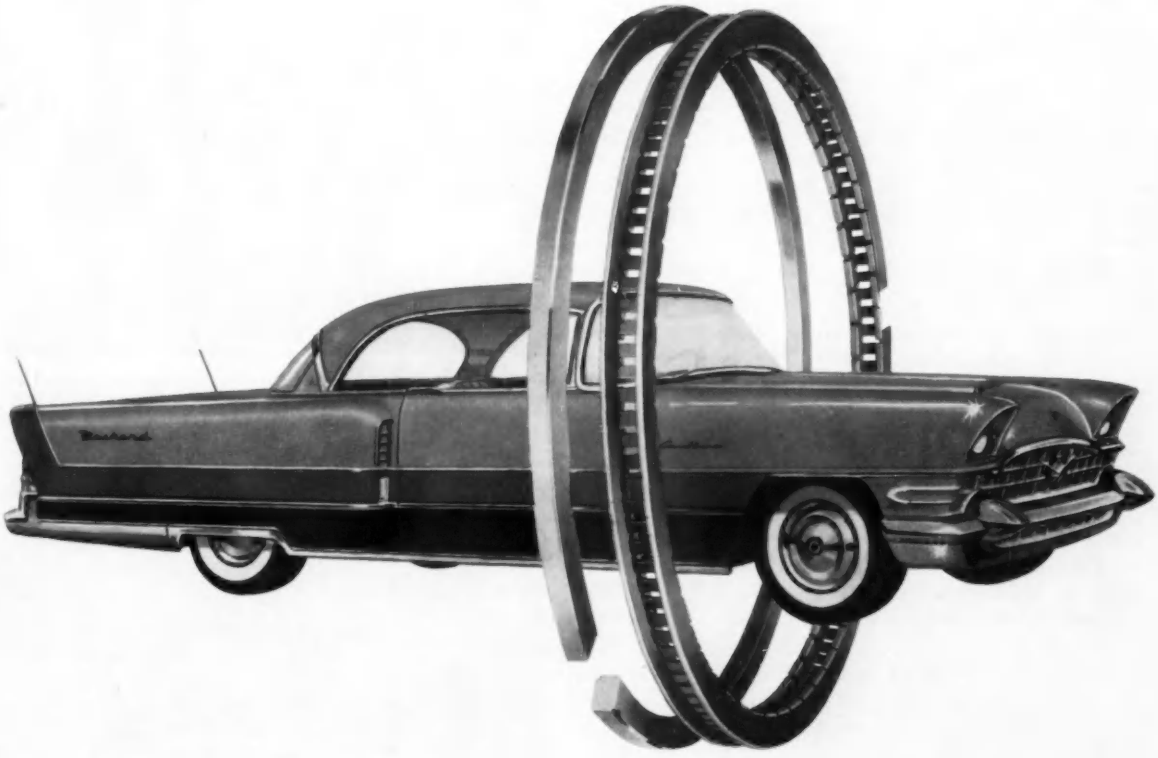
There is now grudging admission by many steel executives that despite their protests, some of their customers have been ordering and getting steel to build up inventories in excess of normal needs. Common business prudence makes steel users anxious to acquire in advance all the steel their resources will permit. With the likelihood of substantial wage increases freely admitted in the bargaining period ahead, it is certain that such increases will be immediately passed along to consumers in the shape of higher base prices, just as was done last July after the wage settlement. While the amount of the increase is anyone's guess at this time, that there will be an increase is not debatable. Hence, the purchase of steel today appears to be a very sound investment, and no doubt explains in part the high operating rate prevalent throughout the industry.

Scrap Price Likely to Stabilize

The price of steel scrap had declined to $48 by mid-March, about $5 below the peak price reached in January, but still $11 a ton more than a year ago. However, the market now appears to be receiving strong support in some areas. With nearly all available blast furnaces

(*Turn to page* 126, *please*)

Designed for **DUTY**



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PERFECT CIRCLE

2 in 1 chrome piston rings . . . the standard of comparison

Automatic Installation of Brake Anchor Pins

An interesting automatic method for attaching the anchor pin to wheel backing plates; and performing some associated machining operations in the same setup has been introduced by the Kelsey-Hayes Wheel Co., Jackson, Mich. To handle this job, the company has installed a battery of three Taylor-Winfield multiple-station, combination welding and machining units, fitted with dial feed indexing tables, operated by a Geneva type indexing mechanism.

The machines are provided with interchangeable dies to permit the handling of both right- and left-hand, and front and back backing plates. Productivity with one operator is said to be of the order of 480 pieces an hour. The control console mounted on the machine has one bank of lights that will indicate the source of trouble in the event the machine stops automatically.

The sequence of operations in this 10-station machine is as follows:

Station 1—Manual loading of backing plate and a reinforcing plate to which the anchor pin is attached

Station 2—Checking station assures that a completed part has been unloaded and new parts properly placed in the die; failure to meet these requirements automatically stops the machine cycle

Station 3—Here the reinforcing plate is projection-welded to the backing plate

Station 4—This is a special head for reaming the hole into which the anchor pin is inserted

Station 5—Anchor pins are hopper fed at this station, automatically picked up and inserted into the reamed hole

Station 6—This is an arbor press head for properly positioning the anchor pin in the plate

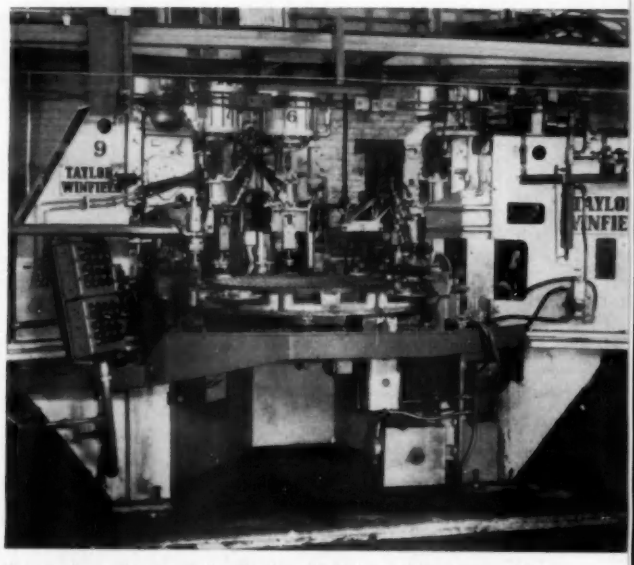
Station 7—At this point the anchor pin is hot upset in place in the assembly

Station 8—Quenching station at which coolant is sprayed over the assembly

Station 9—Pilot diameter on the anchor pin is hollow-milled by means of a mill fitted with retractable type carbide-faced cutters holding the operation to a tolerance of 0.002 in.

Station 10—Manual unloading

It may be noted that both the backing plate and reinforcing plate are of low carbon steel while the anchor pin is of medium carbon steel. The entire operation is subject to close tolerances both as to machining and location. For example, the assembly of the anchor pin must be so held that the distance from the center of the anchor pin with respect to the center line of the backing plate does not vary more than plus or minus 0.003 in.



Front view of one of the Taylor-Winfield welding assembly machines. It is one of a number of similar units installed in the Kelsey-Hayes plant in Jackson, Mich.

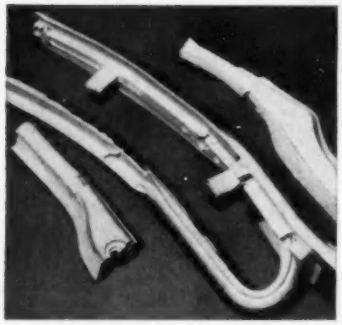
Close-up of one of the Taylor-Winfield combination welding and machining units in actual operation at Kelsey-Hayes. The backing plates are delivered to the operator's station on the monorail conveyor and are loaded on table in the foreground. Smaller parts required for the assembly are fed from the hopper to the left within easy reach of the operator.

Using

DU PONT ELASTOMERS

NEOPRENE-HYPALON®

in Design



HYPALON® adds extra life to weather stripping, cable covering, spark-plug boots

Automotive designers are putting HYPALON to work at many varied tasks. One use for Du Pont's new synthetic rubber is as a protective coating for rubber weather stripping on trucks, buses and automobiles. (See photo above.) It protects the rubber stripping from deterioration by weather, sunlight and wide extremes of temperature.

Other uses for HYPALON include ignition-cable jacketing and molded spark-plug boots.

Products made of HYPALON offer extra-long life, especially under exposure to severe service conditions. They withstand temperatures from 250°F. to 350°F.; are unaffected by ozone, sunlight and weather; resist chemical attack. And HYPALON can be compounded in an unlimited range of light-stable colors.

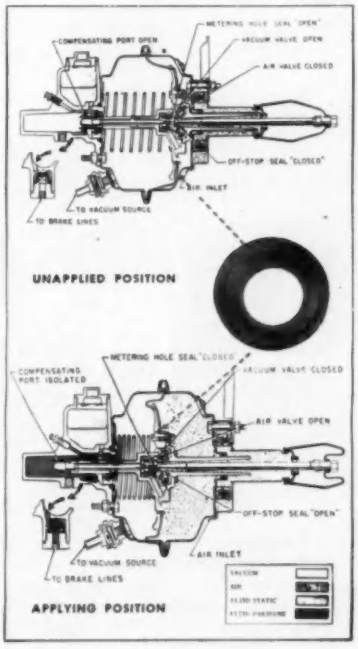
In addition, HYPALON resists oil, grease, chemicals . . . withstands abrasion and flex cracking. Why not find out how HYPALON can help you? We'll be glad to send you further information. Just clip and mail coupon.

Over 1,000,000 NEOPRENE diaphragms now used in Kelsey-Hayes power brakes

Neoprene chosen for resilience, flex and heat resistance

Before Kelsey-Hayes specified neoprene for the brake diaphragms of their power brake, they tested several materials. The material to be chosen had to withstand a minimum of 500,000 flexing cycles through a full three-inch stroke (see photos).

Ordinary rubber diaphragms couldn't take the punishment, but those made of neoprene lasted well over 1,000,000 cycles—twice the durability demanded. Kelsey-Hayes engineers also found that neoprene *retains* its resilience at temperatures ranging from -40°F. to 200°F. The end result is that neoprene diaphragms are now used in over one million Kelsey-Hayes units.



Many other automotive uses for neoprene

The unique *balanced combination of properties* offered by neoprene products has led to its use for many automotive applications. As a radiator or heater hose, it withstands the deteriorating effects of oil, grease and heat. And its resistance to weathering and sunlight provides long product life in many applications where exposure to weathering is necessary. Neoprene stands up where ordinary resilient materials fail, improves product performance, cuts replacements.

We'll be glad to send you further information on the use of neoprene in creating new products and improving old ones. Just clip and mail coupon below today.

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Please send further literature and add my name to the mailing list for your free publications, the "Neoprene Notebook" and "Facts about HYPALON®," which show how the Du Pont elastomers are used in designing new products, improving old.

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Wilmington 98, Delaware

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Firm_____

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City_____ **State**_____

AI TABLOID

(*Continued from page 37*)

Firestone Tire & Rubber Co. has purchased a 1000-acre industrial site for the manufacture of petrochemicals in Orange, Tex.

* * *

Marquardt Aircraft Co. will modernize and expand its research and development facilities at Van Nuys, Calif., with a construction program calling for an expenditure of nearly $6 million.

* * *

Bridgeport Brass Co. and Hunter Douglas Aluminum Corp. have agreed to join forces . . . Kindred Aviation Co. has purchased Engine Supply Co.

* * *

Acme Steel Co. has broken ground for a new $1.5 million office building in Riverdale, Ill.

* * *

Toyota Motors Co. Ltd., of Japan is said to be investigating the possibility of setting up a vehicle assembly plant in Mexico.

* * *

Burdett Manufacturing Co. has moved to a new plant at 4920 S. Monitor Ave., Chicago, Ill.

* * *

Aluminum Co. of America is considering the erection of a new smelting plant that would boost its primary aluminum capacity by 20 per cent.

* * *

McDonnell Aircraft Corp. has received an order for additional F3H2N Demon Fighters from the Navy totaling over $55 million.

Fastex Div., Illinois Tool Works—Kenneth G. Peters has been promoted to advertising manager.

MEN *in the* NEWS

(*Continued from page 41*)

Dodge Div., Chrysler Corp.—**William C. Cawthon** has been named general superintendent of car manufacturing; **Cecil N. King**, foundry manager; **Rudolf G. Schmalenberg**, methods manager; **John Van Dam**, general superintendent of machining; **R. D. Engle**, chief engineer of car operations; **S. J. Tompkins**, chief engineer of truck operations; **George W. Gibson**, assistant chief engineer of car operations; and **Wendell D. Moore**, assistant sales manager of advertising and sales promotion for passenger cars.

Warner & Swasey Co.—**Robert L. Groves** was chosen European district manager.

Houdaille Industries, Inc., Hydraulics Div.—**Eric G. Boehm** has been named general manager.

National Plastic Products Co. — **Howard S. Ortgies** is now export manager.

York-Gillespie Manufacturing Co.—**R. G. Dragar** has been named chief engineer.

Glenn L. Martin Co., Denver Div.—**Albert L. Varrieur** was named general manager.

Axelson Manufacturing Co.—**F. B. Tannehill** was named chief industrial engineer.

Industry News

(*Continued from page 39*)

$70 Million Jet Engine Contract Goes to Ford

Latest Government contracts to industry include a $70.4 million award to Ford Motor Co., for production of turbojet engines. It brings to more than $335 million the value of jet engine contracts the company has received from the Air Materiel Command since last December. The engines will be made at Chicago.

L. A. Young Acquires Power Loader Concern

L. A. Young Spring & Wire Corp. has purchased the assets of Woodside Power Loader Div. of Woodside Industries, Milwaukee, Wis. Equipment made by Woodside will complement production of L. A. Young's Daybrook Hydraulic Div. in Ohio, where Woodside manufacturing operations will be transferred later.

Cummins $6 Million Outlay Set For 1956; Engine Output Rises

Cummins Engine Co. has announced a $6 million capital program for 1956. Included is construction of a 73,000 sq ft addition to its manufacturing plant.

It was further stated that upon completion of the 1956 program, Cummins will have expended $17 million on capital additions in the six-year period beginning in 1951 when its first major plant expansion program was initiated.

Steps are also being taken to increase immediately the production rate of Cummins Diesel engines by an additional 17 per cent. This rise is over and above the 21 per cent increase announced in January.

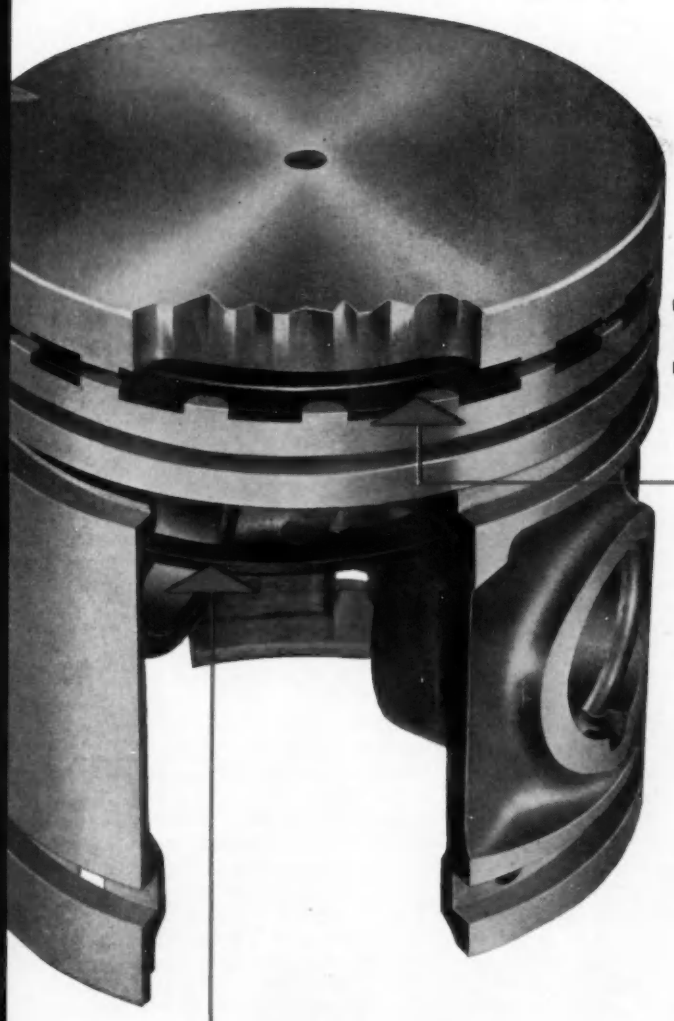
FIVE AREAS SHOW PERCENTAGE GAIN IN JANUARY OVER THE FIRST MONTH OF 1955

Regional Sales of New Passenger Cars

Zone	Region	January 1956	December 1955	January 1955	Per Cent Change: January over December	Per Cent Change: January over January, 1955
1	New England	22,134	23,694	25,571	− 6.58	−13.44
2	Middle Atlantic	59,863	116,733	79,959	−48.72	−25.13
3	South Atlantic	62,246	83,484	61,342	−25.44	+ 1.47
4	East North Central	115,104	156,694	109,911	−26.54	+ 4.72
5	East South Central	21,109	38,063	21,985	−44.54	− 3.98
6	West North Central	37,246	50,614	41,019	−26.41	− 9.20
7	West South Central	39,600	64,592	36,915	−38.69	+ 7.27
8	Mountain	13,558	22,969	12,193	−40.97	+11.19
9	Pacific	60,788	73,645	51,129	−17.46	+18.89
	Total—United States	431,648	630,488	440,024	−31.54	− 1.90

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Cal., Ore., Wash.

NOW! STERLING CONFORMATIC* PISTONS



CONFORMATIC STEEL CONTROL MEMBER, anchored at the pin bosses only, controls skirt clearance . . . hot or cold! The metered steel insert allows you to specify the piston clearance you want for your engine. (Clearances from zero to ½ thousandth inch are generally recommended.)

are available with LOW COST Intra-Cast* STEEL-LINED GROOVES

***Steel protection—top and bottom*—gives sensationally longer life to rings and grooves.**

This ring is *integrally cast* into the piston . . . positioned so that when the grooves are machined, the top ring groove is *lined with steel* and has islands of aluminum for ring cooling. This Intra-Cast steel-protected groove resists enlargement and materially reduces top ring land wear and rounding. And, it does it at far less cost than other methods.

** Tradename Registered*

STERLING ALUMINUM PRODUCTS INC.

ST. LOUIS, MISSOURI

News of the MACHINERY INDUSTRIES

(*Continued from page* 79)

is an arbor, slightly smaller in diameter than the bore of the pinion, for carrying the pinion into the operating position. Both air cylinders function by cam-operated electrical controls.

At the start of a sequence of automatic operations, the ram is drawn back to allow one pinion to roll from the feed chute into the loading position. Moving ahead at high speed, the ram inserts the arbor in the piece and carries it toward the work-gears. As the pinion nears them, the speed of ram travel is reduced by applying air to a Hydrocheck valve through a switch and solenoid, and the pinion is moved into mesh with the slowly rotating work-gears. The ram and pinion continue to advance to a fixed stop, pushing the previously completed piece out of mesh and into the discharge chute. The ram travel direction is reversed and movement stopped when the new position is in the operating position. The work-gear on the fulcrumed arm is now lowered into position, and the work-gear drive shaft begins to rotate at high speed. At the end of the pre-set time cycle for conditioning the tooth surfaces, slow rotation of the work-gears is resumed, the fulcrumed arm is raised, and the loading arm is retracted. Another pinion rolls into loading position and the sequence is repeated.

Crosby Now Director of BDSA Metalworking

Joseph P. Crosby, vice-president and director of Lapointe Machine Tool Co., Hudson, Mass., has been named Director of the Metalworking Equipment Div., Business and Defense Services Administration, U. S. Department of Commerce, by BDSA Administrator Charles F. Honeywell.

In accepting the appointment as Director, Mr. Crosby brings to the BDSA current expert knowledge of the metalworking and related industries gained through long experience in the field. A specialist in the broaching technique of metal removing, he is the immediate past president and a director of the American Society of Tool Engineers.

Around the Industry

Installation of a double-acting hydraulic press of 1500-ton capacity, has been completed at the Worcester plant of Wyman-Gordon Co., raising the number of hydraulics at the plant to six. It also has 31 steam drop hammers. The new press was made by Birdsboro Machine and Foundry Co. of Birdsboro, Pa. It weighs 220,000 lb on the foundation and is a duplicate of a press in use in Worcester since 1954.

H. L. Tigges has announced his retirement from Baker Brothers, Inc., where he has been serving as executive vice-president, to enter into business for himself as consultant on machine tools. Mr. Tigges has served Baker Brothers 40 years in engineering, sales and executive capacities; he will continue to serve Baker Brothers in an advisory capacity. He is a past president of both the National Machine Tool Builders' Association and the American Society of Tool Engineers.

From Cincinnati Milling Machine Co. we learn that Dr. M. Eugene Merchant, assistant director of research, has been appointed to the National Advisory Committee for Aeronautics sub-committee on lubrication and wear, and has been made a member of the International Institution for Production Engineering Research.

National Automatic Tool Co., Inc., increased its sales force by 75 per cent during 1955, according to K. P. Martin, vice-president in charge of sales. The home sales office in Richmond, Ind., is being expanded to make possible more complete services. Twenty-one sales engineers now operate from Natco's district offices, an increase of nine over 1954.

C. W. Lang, sales manager of the Hydraulic Div., Sundstrand Machine Tool Co., Rockford, Ill., has announced the opening of a new office in Summit, N. J. John F. Griffey, district sales manager, and James F. Nelson, sales engineer, will make their headquarters in the new office.

Swedish Automobile Manufacturer Has Compact, Modern Paint Shop

(*Continued from page* 71)

consequently, at a correspondingly reduced speed. This makes possible the use of shorter tunnels without affecting the established drying time.

The design of the conveyor system was facilitated by the adoption of flush floor chain instead of an overhead monorail system. The main conveyor is a roller chain carried between two U-channels, with flanges flush with the spray booth grating. The same is true of the reversed U-channels serving as rails for the carriage casters. With this arrangement the carriages are guided by chain bolts, two for each carriage — the one in front driving, the one in the rear guiding.

Tunnels are built in sections approximately 20 ft long, the amount of energy supplied to each one being independently regulated to provide either slow or rapid heating, short or long holding time, etc. For equalizing the temperature of the body to prevent differences in temperature in different portions of the bodies where they may be exposed to different ranges of radiation, a convection air current is provided in each tunnel. This is held at the temperature of the body in each instance. The convection system is bled constantly to remove solvent fumes.

Cold air curtains are provided at each tunnel exit for cooling bodies to a safe working temperature for the operators. In addition, conventional air seals are installed at both ends of all tunnels.

Replacement air is supplied at a rate of 2000 cfm, being filtered in three stages but without resort to water wash. The first stage is a conventional contact filter with automatically oil-dipped steel wool panels. The second stage is a fiber panel filter of conventional type, followed by heating. All of the associated equipment for circulation, filtering, and heating is mounted on the roof of the building. Filtered and heated air then is passed through a third stage — a newly developed fiber-plastic cloth installed in the ceiling of each spray booth which serves to distribute air over the entire width and length of the booth as well.

It is of interest that the speed of the main conveyor is eight feet per minute while that of oven conveyors is six feet, six inches per minute. Installed electrical power is 7.5 kw per ft. Temperature of oven inside walls is 470 F, a maximum of 570 F being available.

Finally, it may be noted that the entire installation, together with the various controls and recording equipment was installed by Werner & Pfleiderer, of Stuttgart-Feurbach, Germany.

News about

B. F. Goodrich Chemical *raw materials*

Hycar rubbers in automotive design ...for heat and oil resistance

HYCAR rubbers, with their outstanding qualities of resistance to gas and oil and extremes of temperature are opening doors for the design engineer.

Hycar nitrile rubbers can be compounded for exceptional oil and aromatic solvent resistance or low temperature flexibility. Hycar polyacrylic rubbers withstand oil and dry heat up to 350° F.

Whatever the compound of Hycar rubber, these characteristics stand out:

1. **Hycar vulcanizates are oil resistant.**
2. **Resist most solvents and chemicals.**
3. **Excellent abrasion resistance.**
4. **Highly resistant to normal aging.**
5. **Low compression set characteristics.**
6. **Low gas permeability.**
7. **Color range is unlimited.**

The design possibilities of Hycar have led to many outstanding automotive improvements. For example: brake expanders and liners, diaphragm materials, gaskets, packing, seals, fuel and oil hose, mountings and bushings, mats and flooring.

Perhaps Hycar can help solve a design problem for you. If you want to investigate the possibilities of Hycar rubbers, please write Dept. EA-2, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B. F. Goodrich Chemical Company
A Division of The B. F. Goodrich Company

Hycar
Reg. U. S. Pat. Off.
American Rubber

GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

Observations

By Joseph Geschelin

Interior Progress

National Automotive Fibers showed an exciting display of its wares recently. The company, which now makes everything from carpets to upholstered seat assemblies, has some new developments in foam rubber, plastics and other materials. One of the most interesting of its advanced ideas was a rigid, one-piece formed roof panel to replace conventional headlining. It is formed to size and shape and can be installed through the rear window opening. It comes complete with headlining material and can also include the roof panel sound deadener. Apart from production economies incident to this design, it is of value to stylists since it may be responsible for lowering the roof line by ½-⅝-in. or more.

Progress Evolves

Transfer machines for automatic machine lines have gone through a number of evolutionary changes in a relatively few years. We learn that a new plant, soon to be built, will try an entirely new tack. It will employ relatively small machine units as nearly standard as possible and tied together by short sections of transfer conveyors. It is a big move to greater flexibility since this will make it easier to remove or add small sections when product changes dictate.

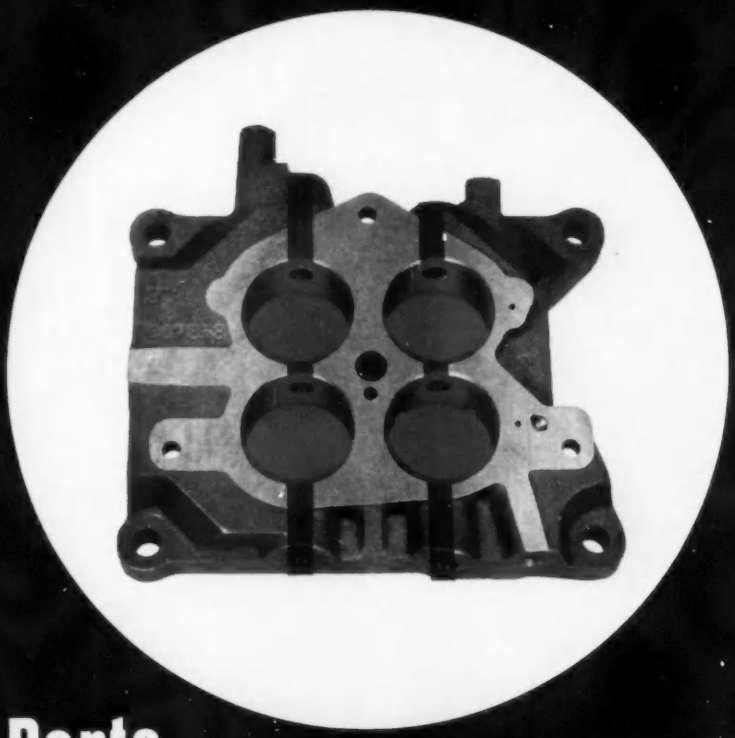
Improved Brakes

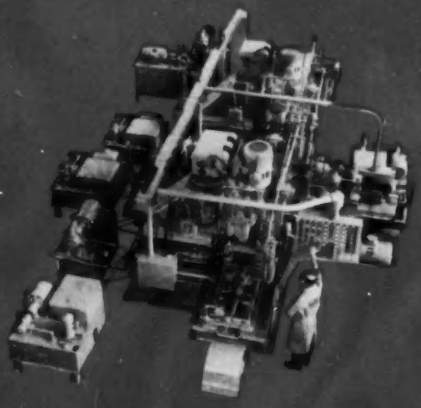
Heaviest attended session of the recent SAE Passenger Car Meeting was the one on brakes, 11-in. brakes, that is. Five speakers served up the current trend from the English Girling design to a proposed Bendix job combining the features of both disk and shoe brake. It seems that 1957 will be a year of decision insofar as brakes are concerned, assuming that 14-in. wheels will be used across the board.

Military Concept

In his luncheon talk at the recent SAE Passenger Car Meeting, Captain R. H. Sawyer of the Detroit Arsenal asked the industry to set its sights on the development of an entirely new family of engines for the Ordnance program. They need small, light packages with maximum output of the order of 150-hp. He revived the formula made familiar in Detroit circles some 15 years ago — "One hp/cu in.; one lb/bhp; $1 per lb." He thinks it can be done today.

Here's Automatic Production On High-precision Parts





Multiple-spindle drilling, boring, facing and tapping machines
Special machines for automatic production

When is fast transfer production limited by precision requirements? This frontier is steadily being pushed back by Natco engineers in new Holeway processing machines.

Take this throttle body, for example. The large holes are reamed to *limits of .0015" for location, .0003" for size, 125 microinch* finish! Production—*600 parts per hour!*

Natco's high-speed gun-drilling heads give required finish in interrupted throttle-shaft holes without reaming. Size is held to within .001".

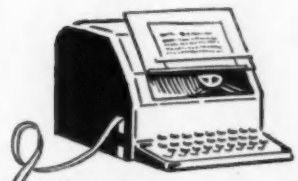
Many unusual problems are solved in locating, holding and positively controlling light-weight parts between stations at high transfer speed. Chip disposal is automatic; cutting oil is filtered for re-use.

Here's the sequence of operations. Combination rough and semi-finish ream four large holes. Gun drill two holes (two breakthroughs each). Finish ream four large holes.

Whenever fast, automatic production makes sense, don't let high-precision requirements stop you. A Natco engineer can tell you in a hurry whether it's feasible and how the job can be done.

NATCO

National Automatic Tool Company, Inc. *Richmond, Indiana*



ON OUR WASHINGTON WIRE

Capital expansion outlays by all types of businesses in 1956 are expected to total $35 billion, compared with less than $29 billion in 1955. The automotive industries plan a $1.9 billion program, while iron and steel producers intend to put $1.3 billion on the line.

Small Business Administration has prepared a new leaflet on requirements for selling to the Government. Entitled "Pointers on Government Contracting," copies are available from SBA field offices.

Test sales of surplus military electronic and aeronautical spare parts through selected dealers will be started by Defense Dept. this spring. Later program may include sales of such other surplus items as automotive equipment.

Two price lists (Nos. 25 and TID-1901) of technical reports released by the Atomic Energy Commission for public sale are now available. They may be obtained free from Office of Technical Services, Commerce Dept., Washington 25, D.C.

Roadbuilding outlays by all levels of government in the next five years could add up to $23 billion without the planned giant highway programs. This total would be reached if spending continued at the 1955 rate of $4.6 billion, according to Bureau of Public Roads.

Nickel thinly plated on blades by a new coating process is said to protect the propellers of large Navy aircraft from damage by water spray, stones, and debris.

Air Force is looking for contractors and subcontractors to build quantities of its new automatic missile interceptor.

SHORTIES

If a half a gallon of gasoline were stretched out a distance of 15 miles, it would make a tiny stream about the diameter of hair of a horse's tail. Yet that thin thread of liquid can move a 3000-lb car 15 miles.

•

The best aircraft engines of World War II produced 3000 hp—one horsepower per pound-and-a-half of engine weight. Since that time the U. S. aircraft industry has developed thrust engines with outputs ranging up to 25 per cent eshp — one horsepower for each four ounces of engine weight.

•

Since December, 1945, commercial airlines have invested more than $850 million in new equipment and facilities.

•

Latest available figures for the automotive industries show that eight manufacturers in the $1-million-plus advertising class are spending at an annual rate of $147 million.

•

Stenographic errors in business correspondence are said to increase 1000 per cent as the temperature increases from 78 to 96 deg., according to a recent survey.

•

Power production in the U. S. in 1964 is expected to amount to one trillion, 40 billion kilowatt hours.

•

Spark plugs must operate in 1500 F temperatures, give off 1000, 1500, or 2000 sparks a minute, and withstand explosive pressures as high as 500 psi.

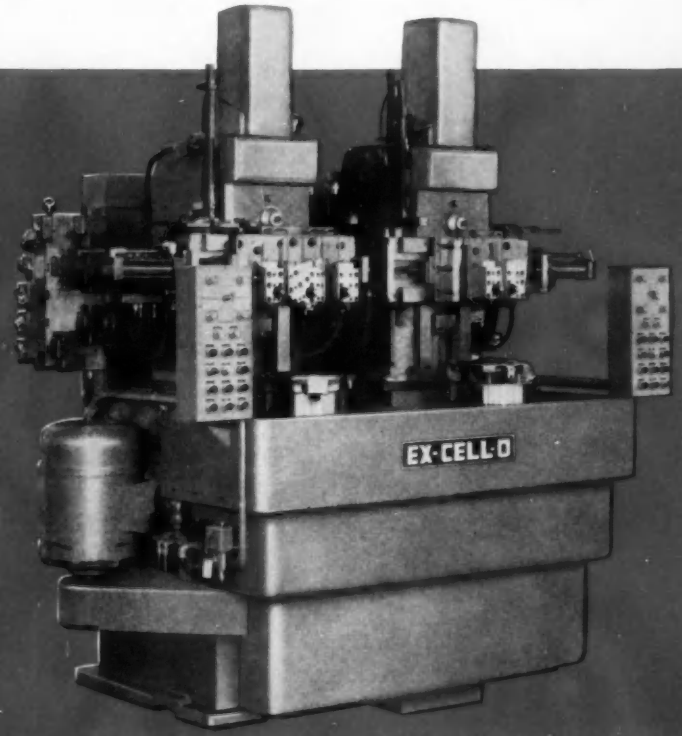
•

A typical U. S. airliner before World War II had two engines and weighed 10 tons. By contrast, a typical modern airliner has four engines and weighs 60 tons.

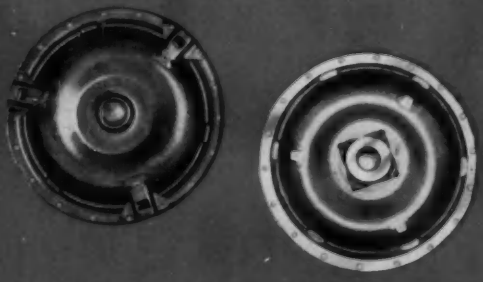
New, Flexible EX-CELL-O 2-STATION VERTICAL..

XLO
EX-CELL-O for PRECISION

PERFORMS VARIETY OF PRECISION OPERATIONS



EX-CELL-O STYLE 432 VERTICAL PRECISION BORING MACHINE has two independent hydraulic systems. No cams to change.

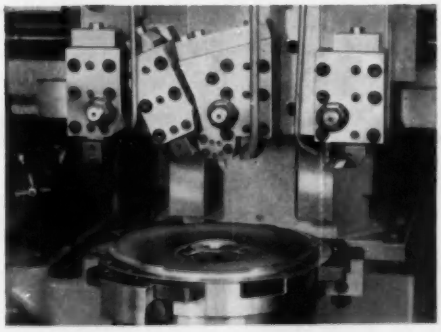


The Ex-Cell-O Style 432 completes the operations on both sides of this transmission torque converter cover in one machine cycle.

Ex-Cell-O's new Style 432 Vertical Precision Boring Machine was designed to speed production *where flexibility is essential.* Vertical construction means convenience in loading and unloading parts, also ease in adjusting and changing tools. Precision turning, boring, facing, grooving, and chamfering are performed alone, or in any combination.

Tool one station for operations on one side of a part; tool the other station for different operations on the other side. Or—let both stations do identical operations simultaneously or in sequence. Or—each station works as an independent machine. Different cycles are obtained through switches, and adjustment of dogs and orifices.

For complete information, call your local Ex-Cell-O representative, or write Ex-Cell-O in Detroit for Bulletin.



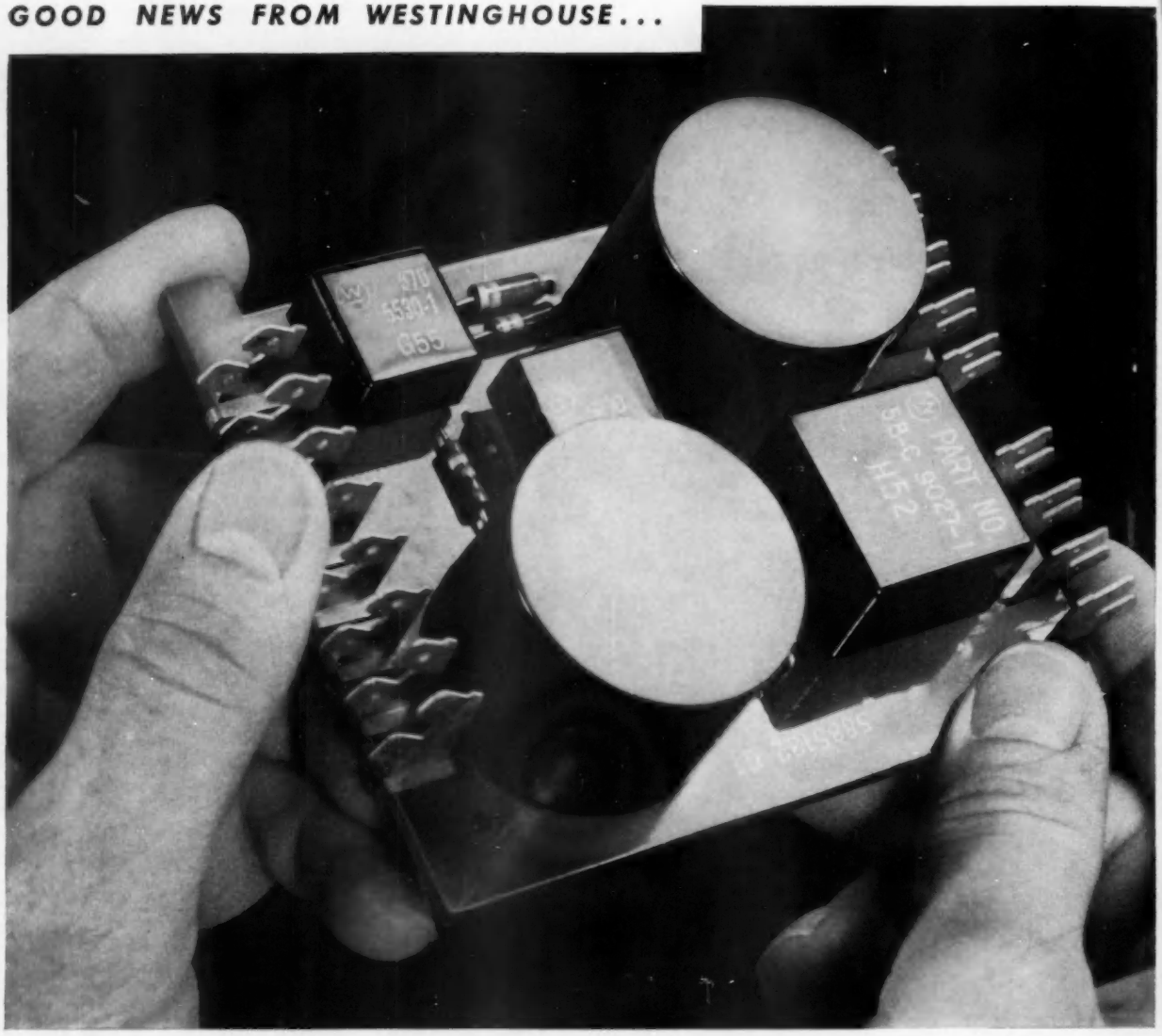
Tooling and chucking equipment of the left station. Slides are wide enough to accommodate tools on both sides of the centerline of a part.

EX-CELL-O CORPORATION
Detroit 32, Michigan

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

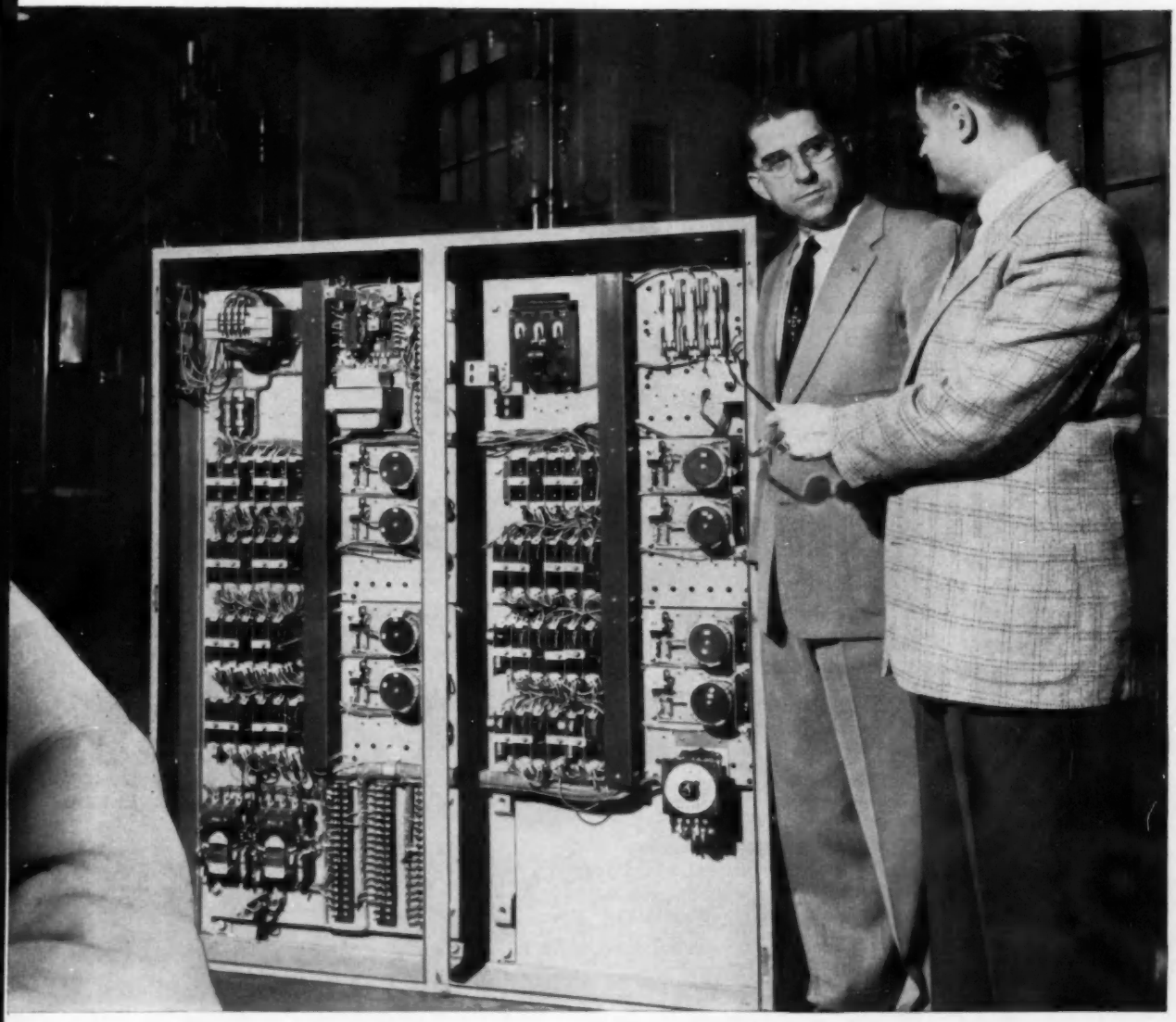
56-2

GOOD NEWS FROM WESTINGHOUSE...



THIS IS CYPAK*

the most revolutionary industrial control advance in 25 years



Just two years ago, production and control engineers alike dreamed of the possibilities of a relay with no moving parts. A reality today, Westinghouse CYPAK introduces static control from units that fit the palm of your hand. CYPAK control has no moving parts to wear, corrode, jam or otherwise cause failure. In addition, CYPAK refines the relay art through making use of basic logic functions.

The result—static control with life at least 15 times that of conventional relays. While twenty million open-close cycles is usually the maximum life of a mechanical relay, CYPAK systems can handle that many cycles in days without a trace of fatigue.

Besides eliminating maintenance and down time, CYPAK opens new opportunities for broader, more complex control. Look into these advantages of CYPAK by calling your Westinghouse sales engineer. J-01002

* Trade-Mark

Write today for your free copy of *The Whys and Wherefores of* CYPAK, Booklet B-6584. Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa.

YOU CAN BE SURE...IF IT'S Westinghouse

Six-Speed Automatic Transmissions

(*Continued from page* 69)

The machine also has a probing station to check the depth of blind drilled holes just before the work can enter the tapping stations.

Allison has added another touch to this equipment to forestall any possibility of trouble with the hydraulic system. To this end, the hydraulic units serving each station of the machine have been fitted with an externally-mounted fluid filter of fuller's earth type.

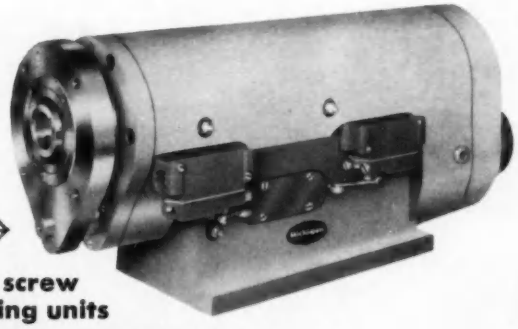
In keeping with present day practice the Buhr transfer machine is served by a large installation of Scully-Jones tool boards on which are carried the entire gamut of preset tools required for each head.

The Buhr transfer machine consists of 46 stations and has 264 working spindles. These include the following: 138 for drilling; 100 for tapping; 12 counterboring; nine rough- and finish-boring; three reaming; one spotfacing, and one facing. During the course of its trip through the machine the case is turned 90 deg at one station; then is turned from horizontal to vertical position later on as described above.

After machining, the case is presented to the impressive Sheffield Precisionaire gaging machine which makes simultaneous checks on 12 qualifying dimensions through the main bore. It gages the stepped bores for size, concentricity, and flatness of certain surfaces. As illustrated, the housing is engaged by gaging heads from both ends to initiate the inspection cycle.

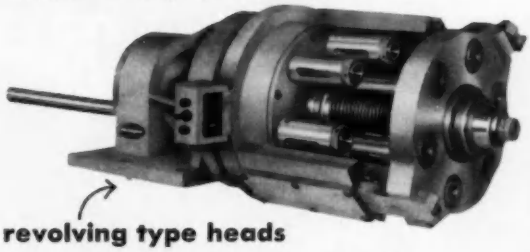
Due to the compactness of the department, as well as the relatively low volume of work, most of the material handling is done by means of gravity roller conveyor sections. The assembly department, however, is provided with a compact Link-Belt power-and-free conveyor system. This starts in one corner of the assembly room right at the end of the short assembly line. As transmission assemblies are completed, each one is attached to a carrier and hoisted on the elevator to engage the power driven conveyor near the ceiling. The power conveyor section transports transmissions directly to the test stands on the opposite side of the room. As a transmission reaches the stand, it is automatically disengaged

(*Turn to page* 114, *please*)



lead screw tapping units

Single-spindle or multiple-spindle, and, plain or flange quill mounting.

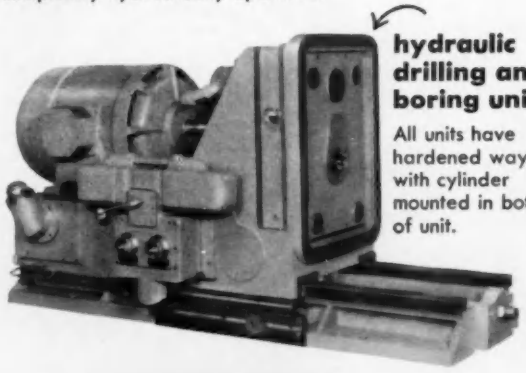


revolving type heads

Mount vertical on *any* center-column machine with rotating chuck.

hydraulic index tables

Simple design—maximum safety—completely hydraulically operated.



hydraulic drilling and boring units

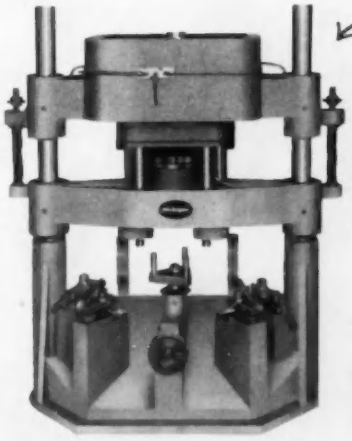
All units have hardened ways, with cylinder mounted in bottom of unit.

use Michigan Components

... For Faster, More Economical Production

Here are a few typical examples of Heads, Bushing Plates, Fixtures, Automatic Index Tables, Hydraulic Drilling and Boring Units, and, Lead Screw Tapping Units used by Machine Tool Builders and Manufacturers, who insist upon the finest, when building or re-tooling.

We also build Revolving Heads for Chucking Machines.



multiple drill heads

Adapted for any type drill press and feed units. Shown with bushing plate and fixture.

We solicit your inquiries on any of your Multiple Drilling Problems.

Michigan DRILL HEAD CO. Detroit 34, Michigan

engineers and manufacturers of production machines and drilling equipment

LINDBERG INDUCTION UNIT IMPROVES HEAT TREATING PROCESSES AT J.I. CASE...

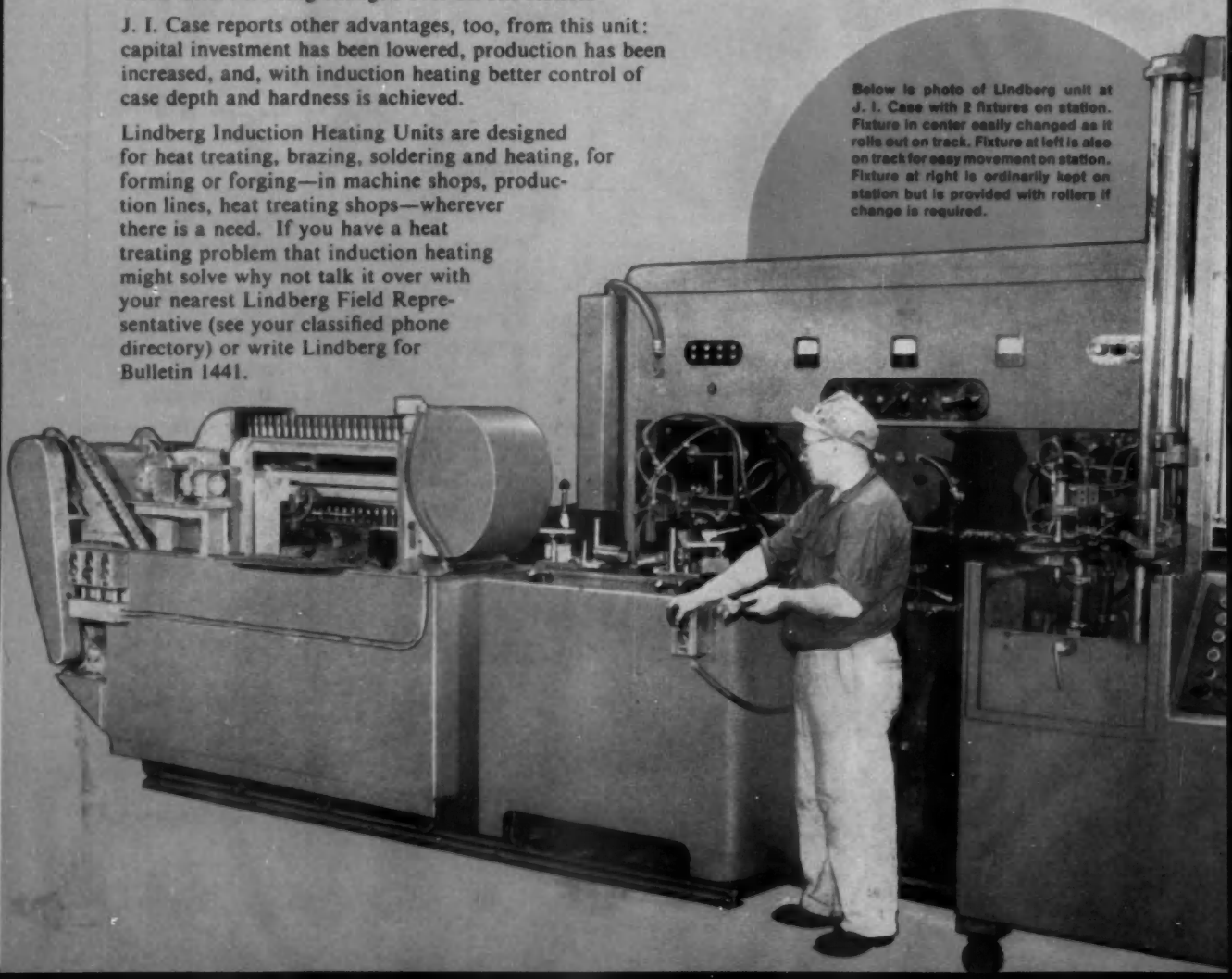
SAVES ½ ITS TOTAL COST— IN 1 YEAR!

A single Lindberg 2-station High Frequency Induction Heating Unit at J. I. Case Co., Racine, Wisc., is providing a happy combination of sizeable cost savings and improved quality and production efficiency in heat treating parts for Case tractors. Actually, the dollar savings effected with this Lindberg unit will repay its total original cost in *less than 2 years!*

This single unit and the five work fixtures provided with it, working on 2 to 3 shifts, 5 days a week to meet production requirements, heat treat some 63 separate tractor parts. Work fixtures are readily changeable, set-up time is materially reduced, and because of the 2-station design, the unit can operate continuously while work fixture is being changed over on one station.

J. I. Case reports other advantages, too, from this unit: capital investment has been lowered, production has been increased, and, with induction heating better control of case depth and hardness is achieved.

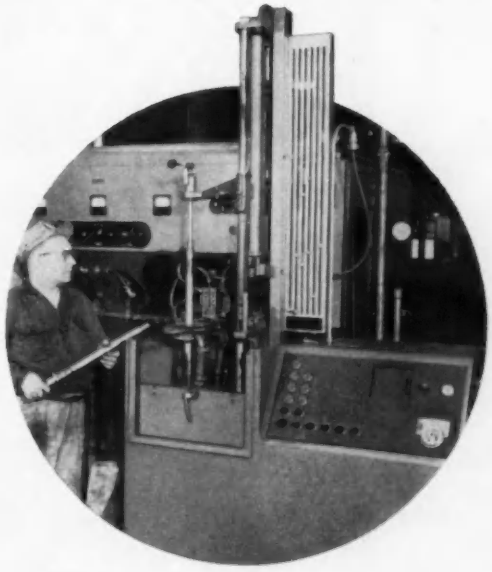
Lindberg Induction Heating Units are designed for heat treating, brazing, soldering and heating, for forming or forging—in machine shops, production lines, heat treating shops—wherever there is a need. If you have a heat treating problem that induction heating might solve why not talk it over with your nearest Lindberg Field Representative (see your classified phone directory) or write Lindberg for Bulletin 1441.



Below is photo of Lindberg unit at J. I. Case with 2 fixtures on station. Fixture in center easily changed as it rolls out on track. Fixture at left is also on track for easy movement on station. Fixture at right is ordinarily kept on station but is provided with rollers if change is required.

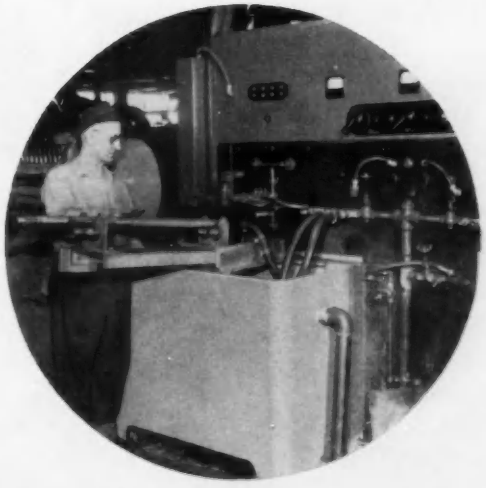
(Above) Hydraulic male coupling is being treated on this fixture. 3 other parts are treated by it, too.

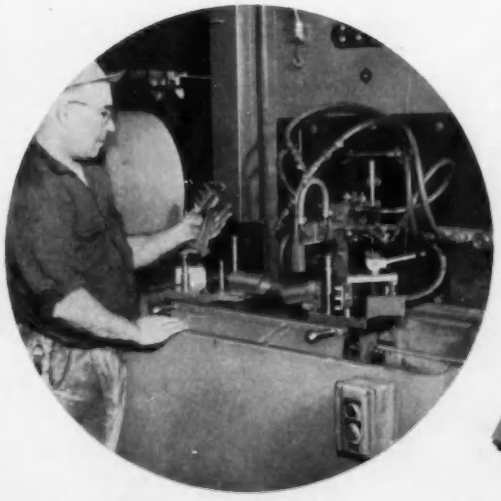
(Below) This fixture is shown selectively hardening a front axle king pin. It handles piece up to 45½" long, 35" of which can be scanned to desired depth. It is also used for 34 other parts.



(Below) Power take-off hydraulic drive shafts are one of the 3 parts treated by this fixture.

(Above) This shows fixture handling inlet and exhaust valve rocker arms. Same fixture treats 6 other parts.





(Above) This fixture is selectively hardening pads and slots on shifter forks. It is also used for treating 17 other parts.

Automatic Transmissions

(*Continued from page* 110)

from the conveyor and remains stationary until the operator is ready to load it into the test stand.

At the present writing Allison has two of the final test stands in operation, each one served by an elevator for lowering the unit into the test stand, and for elevating it to the power conveyor after acceptance. The test stands are powered by Buick V-8 engines. The absorption dynamometers are Dynamatics in each case. The main control board for each stand was supplied by Merz Engineering.

Army Ordnance Reveals New Engine Development Program

(*Continued from page* 56)

the economy factor. It shows a low rate over the entire speed range, and a minimum value of 0.485 lb of fuel per brake horsepower hour.

The torque curve shown in Fig. 2 depicts one of the most significant features of this engine. Torque is actually one of the more important indications of an engine's ability to give outstanding output, and it also gives the best picture of an engine's real performance in a car. It can be seen that this powerplant has a relatively flat torque curve, and actually shows a differential from peak of only 4 per cent in the engine speed range of 1500 to 3500 rpm. The maximum torque of 240 lb-ft is obtained at 2500 rpm.

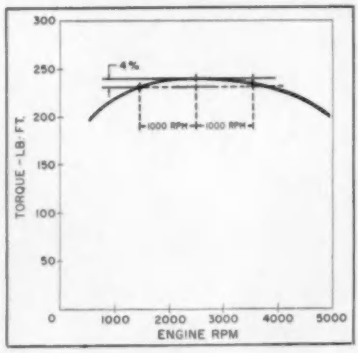
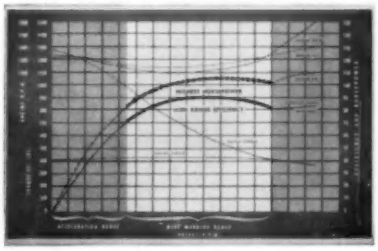


FIG 2

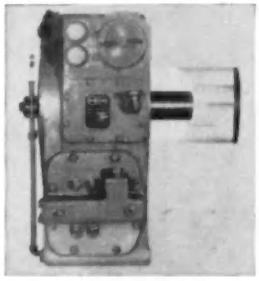
Full Throttle Performance—Torque

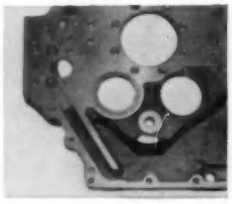
MORE WORK DONE, LESS MAINTENANCE
—these benefits are built in TORCON Torque Converters



✻ Engine efficiency and torque demand in constant balance...

Torcon design provides that the engine will operate at its most efficient speed, with torque multiplication to meet constantly changing demands. Torcon blade design eliminates cavitation, assures high efficiency throughout a wide working range.





✻ Integrated oil system...

Oil sump is an integral part of the housing casting—an important advantage. Internal oil passages are cast in the housing—reducing the number of parts, eliminating unnecessary hoses and fittings, preventing leakages that impair efficiency. Oil flows automatically to lubricate all working parts.

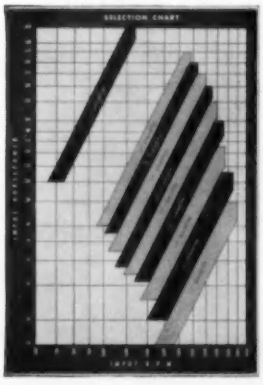
✻ Easy accessibility...

Ample sized cover plates are easily removable for quick inspection—no special tools required. Regulating valves are mounted on the outside of the housing, for immediate inspection.

✻ A complete line—15 to 600 HP

Torcon torque converters include mass-produced standard package units available to equipment manufacturers and to owners and operators for field installation.

A broad range of wheel diameters and options assures a unit that can be fitted readily into any power-transmission system.



THIS BULLETIN WILL BE HELPFUL

A brief, clear statement of Torcon features—well illustrated. Use the coupon.

CLARK EQUIPMENT COMPANY, Transmission Division
Falahee Road, Jackson 2, Michigan
Please send me the Torcon Bulletin

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FIRM _____

ADDRESS _____

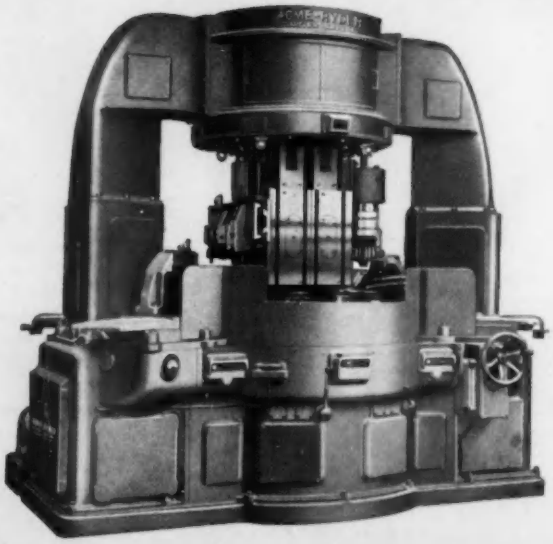
CITY _____ ZONE _____ STATE _____

CLARK® EQUIPMENT

CLARK EQUIPMENT COMPANY
Jackson, Michigan

14" ACME

8-SPINDLE VERTICAL HYDRAULIC



OFFERS MORE

of what you need in a Vertical Chucker

- ★ Sturdy arch frame and massive base construction provides rigid support for top housing and vertical toolslide column.
- ★ Four independently-operated cross slides.
- ★ Feed control of all toolslides by positive cam control.
- ★ Eight vertical toolslides for end-working tools and attachments.
- ★ Wide range of feeds and spindle speeds, with 3-speed selectivity at each work station.
- ★ Operating controls conveniently located at front and rear of machine.

THE NATIONAL ACME COMPANY

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RYDER

CHUCKING AUTOMATIC

Introduced by

NATIONAL ACME

also built in 6-spindle, 17-inch capacity

in response to today's **NEED** *for* **SPEED**

TDA® BRAKES

if it moves...we can stop it

new "DM" brake

...farm equipment

...special duty utility trailers

...lightweight highway trailers

...industrial machinery

"DM" DUPLEX MECHANICAL BRAKE

Best on many jobs, this rugged new DM Brake actually outperforms more specialized brakes. It has proved its worth with farm equipment, special duty utility trailers, light duty highway trailers, industrial machinery, and in a wide variety of special applications. In its many fields, the DM Brake has given outstanding service—providing exceptionally high-torque output and maximum performance for its size.

Greater torque output! The DM Brake is a self-energizing, balanced type . . . the two identical shoes do an equal amount of work in either forward or reverse direction.

Simpler Maintenance and Adjustment! The DM Brake is wedge-actuated through an easily accessible operating lever, giving positive braking with immediate response. The DM Brake can be actuated by either an air or hydraulic cylinder, or mechanical means. Complete accessibility permits quick, easy adjustment. Simple design minimizes maintenance and service.

For expert consultation on your brake problems, contact the Timken-Detroit® Brake Division. Specifications of the DM Brake now available.

TIMKEN Detroit BRAKES

TIMKEN-DETROIT BRAKE DIVISION
ROCKWELL SPRING AND AXLE COMPANY
ASHTABULA, OHIO

Accepted D A Standard

For every industrial, agricultural or automotive application where braking is required!

TDA plants at: Detroit, Michigan • Oshkosh, Wisconsin • Utica, New York
Ashtabula, Kenton and Newark, Ohio • New Castle, Pennsylvania

XIV

This is the fourteenth of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Silicon - What It Is and What It Does in Alloy Steels

Silicon is a very abundant nonmetallic element, one of the chief elementary constituents of the earth's crust. In the form of ferrosilicon, it is used by steelmakers as a deoxidizer and hardener in both alloy and carbon steels.

When the maximum silicon content is specified within the limits of 0.60 to 2.20 pct, the resulting steel is classed as a silicon alloy steel. However, all other standard alloy grades are specified to a range of 0.20 to 0.35 silicon for purposes of deoxidation. Silicon has several interesting effects, among them three that should be noted carefully: (1) it raises the critical temperature for heat-treatment; (2) as the amount is increased, it increases the susceptibility of steel to decarburization and graphitization; (3) combined with other alloying elements such as nickel, chromium, and tungsten, it promotes resistance to high temperature oxidation.

Silicon-Manganese Steels

Of the alloy steels relying heavily on silicon, one of the most important groups is the silicon-manganese series. As mentioned above, silicon is recognized as a deoxidizing agent, and a powerful one. Manganese behaves in the same manner but to a lesser degree.

Manganese exerts beneficial effects on the mechanical properties of heat-treated steel. Silicon as an alloy increases the strength. A properly balanced combination of the two elements produces a steel with unusually high strength, and with good ductility and shock-resistance.

Silicon-manganese steel has been widely used for the making of coil and leaf-type springs. It has also been used successfully for chisels, drift pins, punches, shear blades, mine bits, and other products that must be shock-resistant. It responds readily to oil-quenching, and when tempered at the correct temperature, it possesses not only shock-resistance but toughness and strength.

We invite you to consult with Bethlehem metallurgists whenever you wish to know more about silicon and its uses in steel. If you care to have them do so, these technicians will gladly suggest the proper analysis for your particular needs. Whatever it is, Bethlehem can furnish it, for Bethlehem makes all AISI standard alloy steels, as well as special-analysis steels and the full range of carbon grades.

If you would like to have a reprint of this advertisement, or of the entire series from I through XIV, please write to us, addressing your request to Publications Dept., Bethlehem Steel Company, Bethlehem, Pa.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

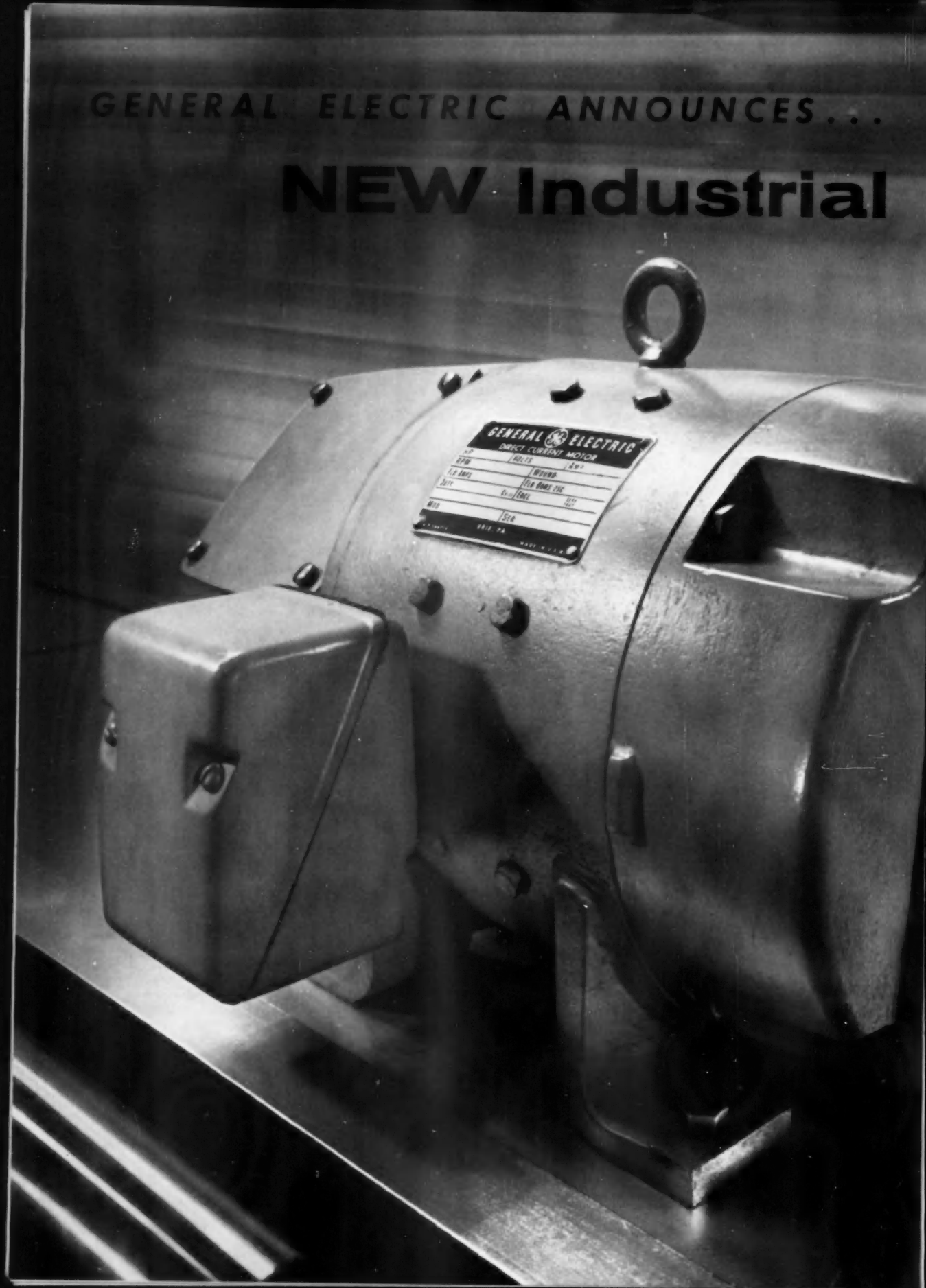
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

GENERAL ELECTRIC ANNOUNCES . . .

NEW Industrial



Direct-current Motor

KINAMATIC* a new standard in direct-current motors, gives your machines wider speed ranges, greater output

To meet modern industrial needs for faster, more automatic, more continuous production, General Electric has designed an entirely new direct-current motor—the d-c Kinamatic.

Designed for Automation—Now, a direct-current motor has been designed for the modern job it has to do—either as individual motor drive or in regulating systems. The new General Electric d-c Kinamatic motor supplies the wide speed range and versatility required for today's manufacturing methods. It is designed for the close control of machines and split-second timing of processes essential to higher output.

Accelerated Production—The new d-c Kinamatic motor will modernize your equipment, give it increased power, higher speeds, greater output capacity. With the quick-acting G-E Kinamatic motor, your machines will process a greater variety of products . . . faster . . . easier . . . and with less maintenance and spoilage.

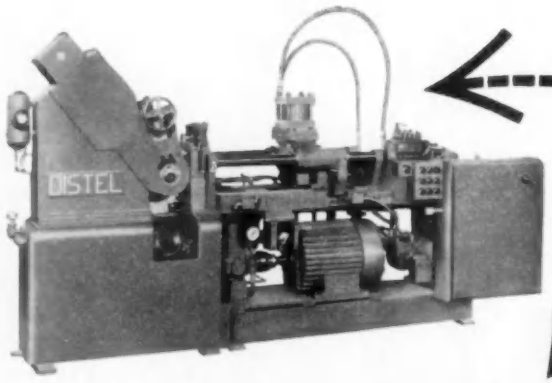
More Powerful—By combining advanced design with improved materials and manufacturing techniques, General Electric engineers have packed more power into the entire Kinamatic line. The powerful Kinamatic motor, with new stamina and durability, is ready to become one of your most effective weapons for keeping costs down, for meeting competition, for boosting productivity levels.

Engineering Help—Industrial specialists in 149 conveniently located General Electric Apparatus Sales Offices have the complete story on how the new d-c Kinamatic motors and generators can benefit your operation. For full details, contact your G-E Sales Representative, or write for Bulletin GEA-6355. *Direct Current Motor and Generator Department, General Electric Company, Erie, Pennsylvania.* 813-1

* Trade Mark of the General Electric Company

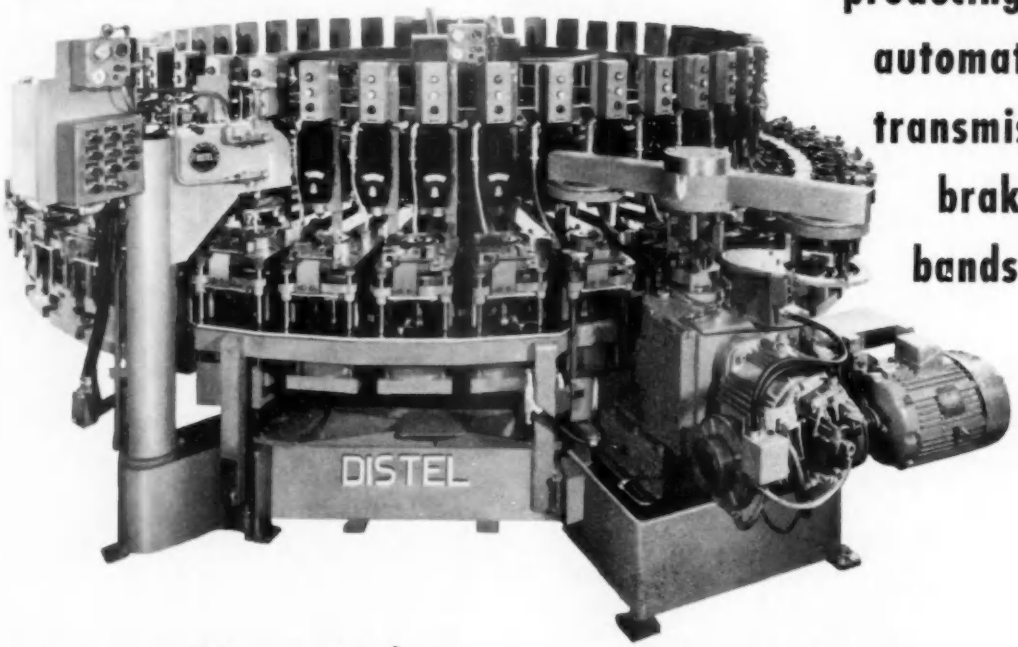
Progress Is Our Most Important Product

GENERAL ELECTRIC



Amazing Team FOR

producing automatic transmission brake bands



a new improved roll form & cut-off machine

constant roll forming and cut-off from coil stock

No lost motion—no lost stock—hydraulic cut-off. Both ends are rolled, formed and cut-off, with no flat ends. Stock Feed Guide bars are hardened and ground.

feeds to roll form, and cuts off, after the forming

Positive locking vertically and horizontally. Heavy, much improved stock-feed runs on ball bearings. Double-action cylinders assures rigid control of lengths.

produces perfect bands

Holds the radius constant at both ends. No convex or concave surfaces.

machine can be used year after year

Readily adjusts for model changes, and diameters varying from 6" to 10".

a new improved brake bonding machine

the "merry-go-round" has 42 stations

It's a rotating machine, with completely balanced weight. Ball bearing, 6' in diameter, provides stability and eliminates vibration. One-shot lubrication for the entire machine. Loading is semi-automatic. Unloading is automatic. Each station is readily accessible.

"merry-go-round" has positive index control

Entire machine can be adjusted to the time control and indexed slower or faster. It continues to operate even if one or more stations are down.

bonds brake lining to steel by low voltage electric heating elements

It bonds 360 brake linings per hour. Pressure is from an expanding air chuck. It's controlled thermostatically at each station.

each station is a complete unit

Each station operates with its own air cylinder, signal lights and gage.

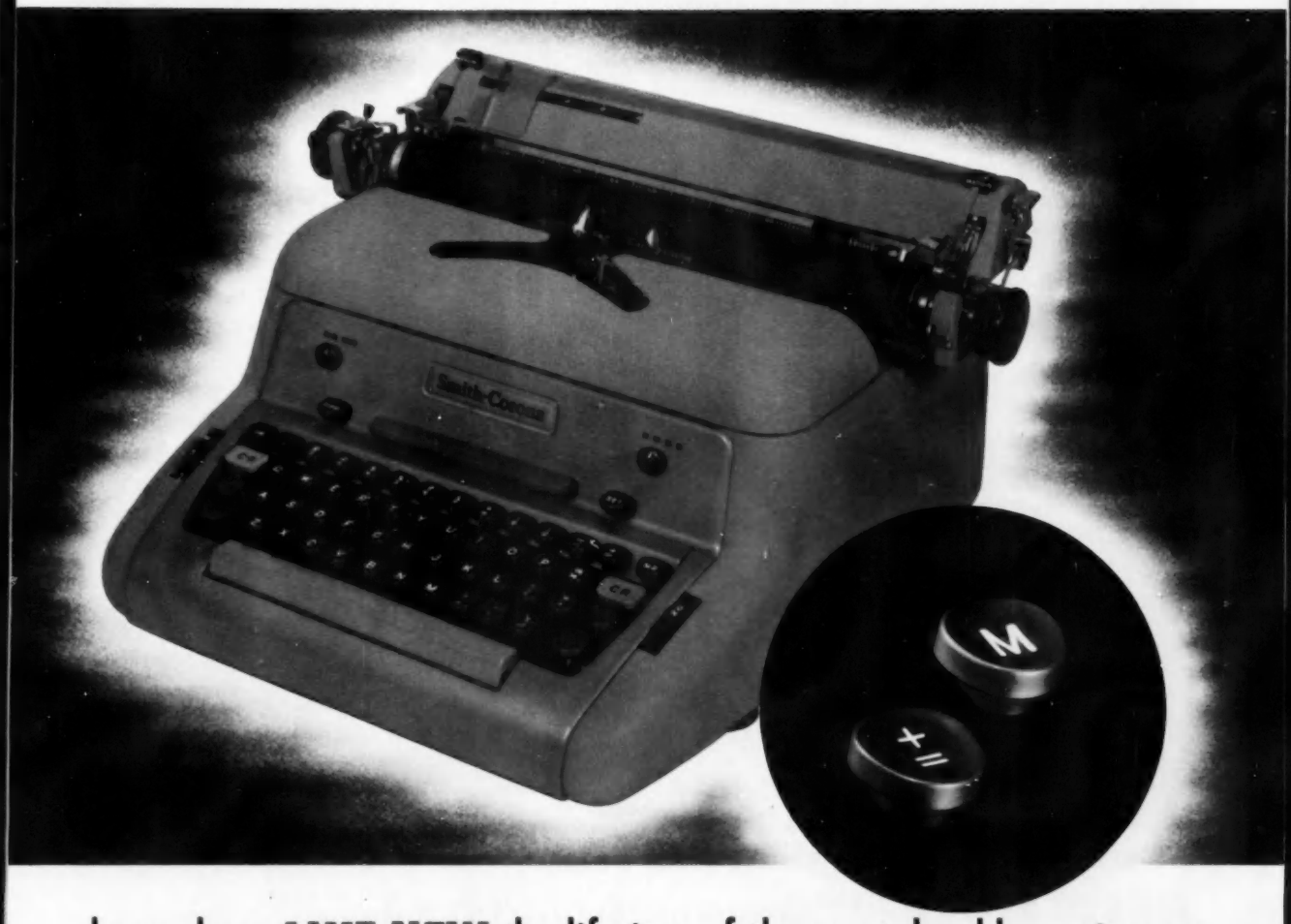
DISTEL TOOL & MACHINE COMPANY

2585 Beaufait • Detroit 7, Michigan

DESIGNERS & BUILDERS OF TOOLS, AND SPECIAL MACHINERY

Beauty That's More Than Skin Deep !

AMERICAN "DOUBLE-SHOT" INJECTION MOLDING



keeps keys **LIKE NEW** the lifetime of the most durable equipment

American's DOUBLE-SHOT Injection Molding *is the ideal way of producing plastic parts with indicia molded in—keys for typewriters, calculators and other business machines—tuning dials—character wheels for registers, speedometers, counters—wheels with cams and gears for special purposes and scores of other applications where permanent indicia is needed.*

Look closely at the keyboard, platen knobs, and other controls on this beautiful Smith-Corona typewriter. Note the clearness of the symbols and numbers. Look again at this same keyboard after years of hard service and you'll see the same "brand new" beauty. You'll find the keys just as brilliant . . . just as readable and indestructible. The secret is below the surface. These parts were formed by American Plastics which has mastered the patented process of Double-Shot Injection Molding.

With this process, letters, numbers and symbols are formed from a separate plastic part, not imprinted or filled in. Get the facts on this surprisingly economical process by *writing direct* to *American Plastics*, one of America's largest suppliers of Double-Shot Injection Molded parts. Address Dept. B

APC PRECISION MADE

AMERICAN PLASTICS CORPORATION

A Subsidiary of Heyden Chemical Corporation

EXECUTIVE OFFICES: 342 MADISON AVENUE, NEW YORK 17, N. Y.

PLASTICS PRODUCTION PARTNER OF AMERICA'S MOST PROGRESSIVE MANUFACTURERS

In any language **TORRINGTON NEEDLE BEARING** *means high capacity!*

From Kalamazoo to Calcutta, the Torrington Needle Bearing is synonymous with *high capacity in minimum space at low cost.*

The unique capabilities of the Needle Bearing have won it world-wide acceptance, established it as "standard equipment" in products made all over the globe.

The Torrington Needle Bearing wins anti-friction assignments in so many places because of its unusually compact design—a full complement of free-running rollers retained by a thin hardened shell which serves as the outer race. This design affords more lines of contact, and thus greater radial load capacity than other bearings of the same size.

As important as the Needle Bearing itself is the knowledge and experience our Engineering Department places at your disposal. With thousands of successful applications behind them, Torrington engineers are eminently qualified to show you the benefits of Needle Bearings in your products.

See our new Needle Bearing Catalog in Sweet's Product Design File—or write direct for a catalog.

TORRINGTON NEEDLE BEARINGS
Give you these benefits

- low coefficient of starting and running friction
- full complement of rollers
- unequalled radial load capacity
- low unit cost
- long service life
- compactness and light weight
- runs directly on hardened shafts
- permits use of larger and stiffer shafts

THE TORRINGTON COMPANY
Torrington, Conn. • South Bend 21, Ind.
District Offices and Distributors in Principal Cities of United States and Canada

TORRINGTON BEARINGS

Needle • Spherical Roller • Tapered Roller • Cylindrical Roller • Ball • Needle Rollers

Rubber Bushings

(*Continued from page* 59)

cage. This rotating action completes the removal of excess rubber which drops through the slots or openings of the cylindrical cage. Mounts then pass into a hot-water washer, out onto an inspection belt, and are boxed by weight for shipment.

Additional operations in the plant include a grinder where salvaged rubber scraps are ground into a fine powder for reprocessing. Adjacent to the grinder location is the hydraulic pump room which supplies the hydraulic presses. Harris Products also maintains a laboratory where quality is continuously checked and new products are tested.

AIIE Conference

(*Continued from page* 65)

Honeywell Regulator Co. He showed the advancement types of systems being used in continuous process, and in the aircraft industries, also fully automatic controls for open hearth operations, etc., employing computers of analog and digital types. The need for computer equipment is dictated today by the requirements of more information, more data on quality, more data on economic factors. He predicted that within a short space of time there will be available digital computers that can take over the entire function of control and data processing.

Evidence was presented that automatic methods require conscious design of the product to suit the equipment and material handling methods. This requires teamwork on the part of industrial engineers and product designers, something that has been in the picture of automotive management for many years.

How automatic controls have been applied by a parts maker was shown in a film by H. J. Foehringer, Thompson Products, Inc., illustrating the current methods for producing valves and other parts. Much of these developments were covered sometime ago in AUTOMOTIVE INDUSTRIES in studies of the Thompson Products operations.

Perhaps the final note was presented by J. A. Bradner, president, The Lees-Bradner Co., in discussing the need for a new look at preventive maintenance. His point was that with increasing automaticity and automatic

controls and feed-back, modern machine tools have become exceedingly complex and require a fresh approach to the maintenance problem. He made a plea for the introduction of formal methods leading to preventive maintenance, means for anticipating tool wear and wear of critical machine elements. Machines are so expensive today that down time is no longer tolerated. PM methods should be worked out to provide inspection and maintenance at chosen times when the job can be done without disturbing production.

Mr. Bradner recommended the training of engineers for the special PM problems of the modern plant. He mentioned that his company urges the customer to assign one or more specialists to visit his plant just before the new machine is going through its final assembly and tuneup. It provides an opportunity for these men to study the design of the machine and thus be more familiar with its functions and maintenance needs. He recommended this procedure across the board for all new machine tool acquisitions.

METALS

(*Continued from page* 94)

in operation, a price upturn would not be unexpected.

No Immediate Decline in Copper Price

At the start of the year the feeling was general in the copper trade that while prices would probably hold through the first quarter, some signs of easiness would appear in the second quarter, and in the second half a really definite price decline would take place.

Such sentiment has now all but disappeared. With copper still in scarce supply in this country and with prices still substantially higher in London than in New York, there appears to be no indication of a waning European demand. The Chilean Government capitalized on this when it asked the American-owned copper producers to advance their price for copper sold in the United States to nearer the level that it obtained abroad. This action was promptly taken but failed to erase the differential between domestic and continental markets.

In short, Europe wants copper apparently regardless of price and is willing to pay high for it. How long this situation will last is unpredicta-

Multiform
BIG BROTHER BENDER

Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender.

Model BBB

SMALLER MODELS AVAILABLE

AIR OPERATED MODELS IN FOUR SIZES

The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches — punching and blanking dies extra. Will punch holes up to 1" and form material up to ¼" thick by 4" wide. We also build smaller models, hand or air operated, for bending materials up to ⅛" x 1½".

Send for illustrated folder AMI-2

SEE EQUIPMENT ON DISPLAY AT BOOTH 721 ASTE SHOW, CHICAGO, MARCH 19-23

J. A. RICHARDS CO. 903 North Pitcher St. Kalamazoo, Mich.

here today...

Portable workbench can be rolled to work location by one man. Doors can be locked to fully protect all contents. Unit is all-welded 1/8-inch and 3/16-inch steel plate construction . . . and can support up to 2000-pounds safely. Heavy-duty roller bearing wheels (hard rubber or phenolic resin) are furnished. Foot-operated locking mechanism securely positions workbench.

Standard "Roll-A-Bench" weighs 325-pounds and is 34-inches high, 41-inches long and 26-inches wide. Other sizes are available to meet individual requirements. *Write* today for literature.

there tomorrow!

Overbeke-Kain
MOBILE WORKBENCH

6755-OK

THE OVERBEKE-KAIN COMPANY
20937 Aurora Road, Bedford, Ohio

Overbeke-Kain

---

three typical
"12 POINTER"
APPLICATIONS
where wrench clearance was the deciding factor...

ALUMINUM MARSDEN
ATOMIC ENGINEERING
APPLICATION

HI-CARBON SPECIAL
AUTOMOBILE ENGINEE
APPLICATION

STEEL "HUGLOCK"
ELECTRIC EQUIPMENT
APPLICATION

The "12 POINTER" Nut Design allows the use of thin wall-socket wrenches (smaller wrench clearance) compact design . . . It provides increased bearing areas, permitting use with softer surfaces without gouging — precise torquing and hopper feeding are other features. The uniformity of this nut makes practical reproducible torques, from part to part and from batch to batch. "12 POINTER" is made in all comparable dimensions, in all popular sizes of standard nuts, as well as "Huglock" and "Marsden" locknuts . . . Send for twelve-page brochure that supplies complete specifications, engineering data and prices.

NATIONAL MACHINE PRODUCTS COMPANY

Manufacturer of Standard and Special "12 Pointer and Hexagon Nuts . . . "Huglock" and "Marsden" locknuts.

44253 Utica Rd., UTICA, Michigan

ble. It is freely admitted by most copper producers that the present price for their metal is too high for their best interests, and fabricators who have been obliged to pass the higher price along to their customers are distinctly unhappy over it. They declare that substitution is encouraged and future growth is reduced, all of which will become apparent in time to their detriment.

With this in mind, it is not surprising that many of the more important fabricators are hastening to get into aluminum, and installing facilities to manufacture the cheaper metal when their customers call for it.

Strong European Demand Supports Price

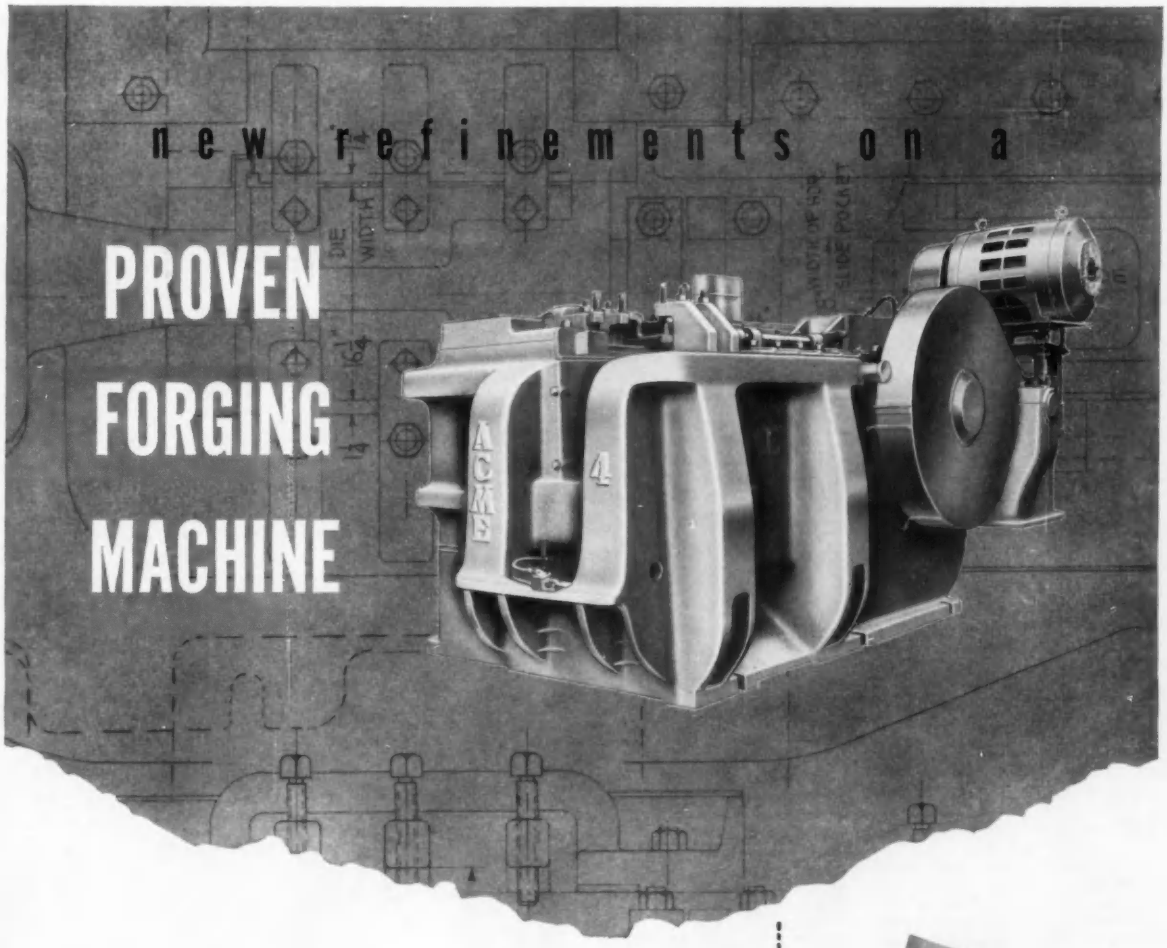
However, there is another school of thought that isn't so certain that the copper price will decline. The British Metal Corporation in its annual review inquires if the impact of modern technology and spreading industrialization on the overall demand for copper may not have been vastly underrated, and asks if the market is not sign-posting a many sided demand for copper in the developing new age of atoms and electronics which will grow faster than it will falter through materials substitution.

It's also true that substitution of aluminum for copper is much more easily accomplished on paper than in the field. Some large copper users have found that substitution involves either broad product redesigning or substantial changes in manufacturing processes, with a final expense as high or higher than the cost of using copper even at present prices.

Perhaps the strongest argument for expecting continued strength in copper demand is to compare per capita consumption here and abroad. In the United States it comes to 15 pounds, but only 1.8 pounds per capita throughout the world excluding this country. If undeveloped countries become more technically advanced with higher living standards, world per capita use should advance amazingly and provide a ready market for the larger output envisioned in the years ahead.

Scrap copper advanced to 45 cents a pound, then slipped back to 44 cents following more supplies to the smelters. This was equivalent to about 51 cents for refined metal delivered 90 days hence and is a pretty good indication that few fears are held for the price up to mid-year. Custom smelters got about 54 cents for April-May delivery but the tonnage they have to offer is small.

(*Turn to page* 130, *please*)



ACME XN 4" upset forging machine with the most powerful grip ever built into ANY forging machine. Plus additional Nitroloy liners for even greater product accuracy. Other improvements insure Higher Output, Lower Maintenance, and Longer life.

The whole story is told in this new catalog of the complete line of ACME XN Forging Machines showing all models with specifications and details of construction PLUS fifteen illustrated technical articles explaining in detail some of the modern methods of upset forging on unusual pieces.

It's Yours For The Asking!

THE HILL ACME COMPANY

ACME MACHINERY DIVISION • **1209 W. 65th St., Cleveland 2, Ohio**
ESTABLISHED 1882

"ACME" FORGING • THREADING • TAPPING MACHINES • ALSO MANUFACTURERS OF "HILL" GRINDING AND POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES

SIMONDS

METALS

(*Continued from page* 128)

Zinc Price Unlikely to Rise

The most recent zinc statistics hardly justify any hope for an early increase in the price, in fact many producers would be happy to have definite assurance that the present 13½ cent level would hold unchanged for the rest of the year.

In February the daily rate of production continued at a record high figure of nearly 3000 tons. Domestic shipments were lower, because of the shorter month, but consignments to government account picked up sharply while exports fell. Unfilled orders declined 15,000 tons and the backlog was down 27,700 tons from a year ago.

Without much doubt the demand for Special High Grade metal has been adversely affected by the cut-back in auto production. A substantial proportion of the diecasters' output normally goes to Detroit. Producers are hopeful that the salutary steps being taken to reduce dealers' stocks of cars will result in renewed activity at manufacturers' plants, and with it improved business for the diecasters.

Lead Unchanged

While lead prices abroad have at times been high enough to divert some Mexican lead away from this country, it is not expected that the domestic price will be raised. Consumption is good but not record breaking. Last year total use of lead came to over 1,200,000 tons, about 100,000 tons more than 1954. As usual, battery manufacturers took about one-third the total output. The decline in auto output has affected the lead demand somewhat.

Nickel in High Demand

Nickel still continues scarce. The official price, established by International Nickel, has been rigorously maintained since 1954 at 64½ cents a pound but this does little good to users who must have metal in excess of their allotments. If they must step into the black market, they will have to pay up to $3 a pound. Stainless steel scrap, of the 18-8 type, sells as high as 20 cents a pound. Producers blame stockpiling for the scarcity. The Government is presently taking about 40 per cent of the production. It's expected that Free World output may increase slightly in 1956, but not enough to ease the market appreciably.

You'll find it HERE!

. . . just about every kind of grinding wheel you can think of . . . from the smallest mounted wheel to the largest roll grinding wheel. Simonds makes them all—all top quality and engineered for your jobs!

Get the Simonds Data Book and Stock List with Consumer Net Prices—and you're set to get the grinding wheels you need, quickly!

CALL YOUR SIMONDS DISTRIBUTOR

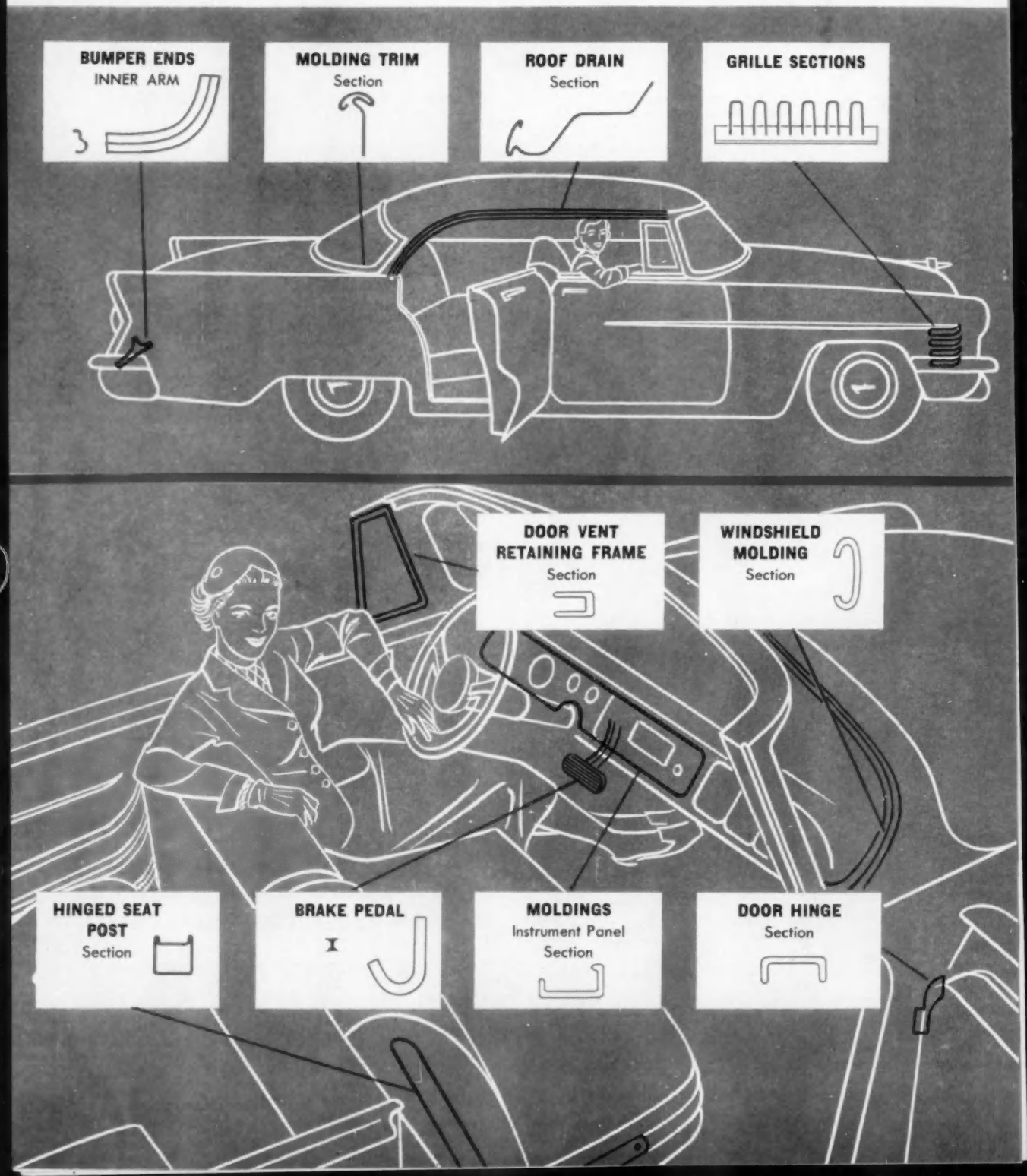
LOCAL STOCK
FAST SERVICE

SIMONDS ABRASIVE COMPANY • PHILADELPHIA 37, PA.

Branch Warehouses: Boston, Detroit, Chicago, Portland, San Francisco. Distributors in Principal Cities

Division of Simonds Saw and Steel Co., Fitchburg, Mass.

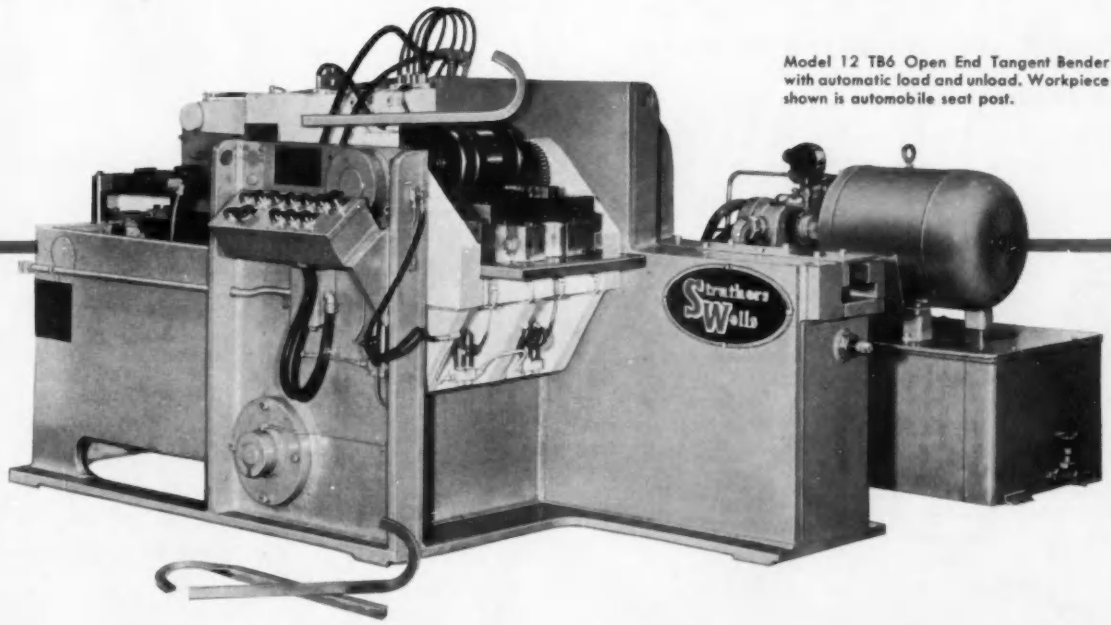
Now available to the Automotive Industry! .....



Struthers Wells ... TANGENT BENDING

of structural parts

For New Production Speed and Economy



Model 12 TB6 Open End Tangent Bender with automatic load and unload. Workpiece shown is automobile seat post.

Struthers Wells Tangent Bending of preformed material—industry's most modern aid to fast, economical metal styling—is now available for automotive production lines. After intensive development and use in appliance manufacture, Tangent Bending is ready for the most efficient automated processes in the automotive industry, eliminating many present wipe bending problems and high tool maintenance. For full information on the Tangent Bending potential for your own operations, send drawings and anticipated production requirements to us in strict confidence. Our recommendations will go forward promptly, without obligation.

STRUTHERS WELLS CORPORATION

Machinery Division **TITUSVILLE, PENNSYLVANIA**

Offices in Principal Cities

STRUTHERS WELLS PRODUCTS:

BOILER DIVISION
BOILERS for Power and Heat . . . High and Low Pressure . . . Water Tube . . . Fire Tube . . . Package Units

FORGE DIVISION
Crankshafts . . . . Hydraulic Cylinders Pressure Vessels . . . Shafting . . . . Straightening and Back-up Rolls

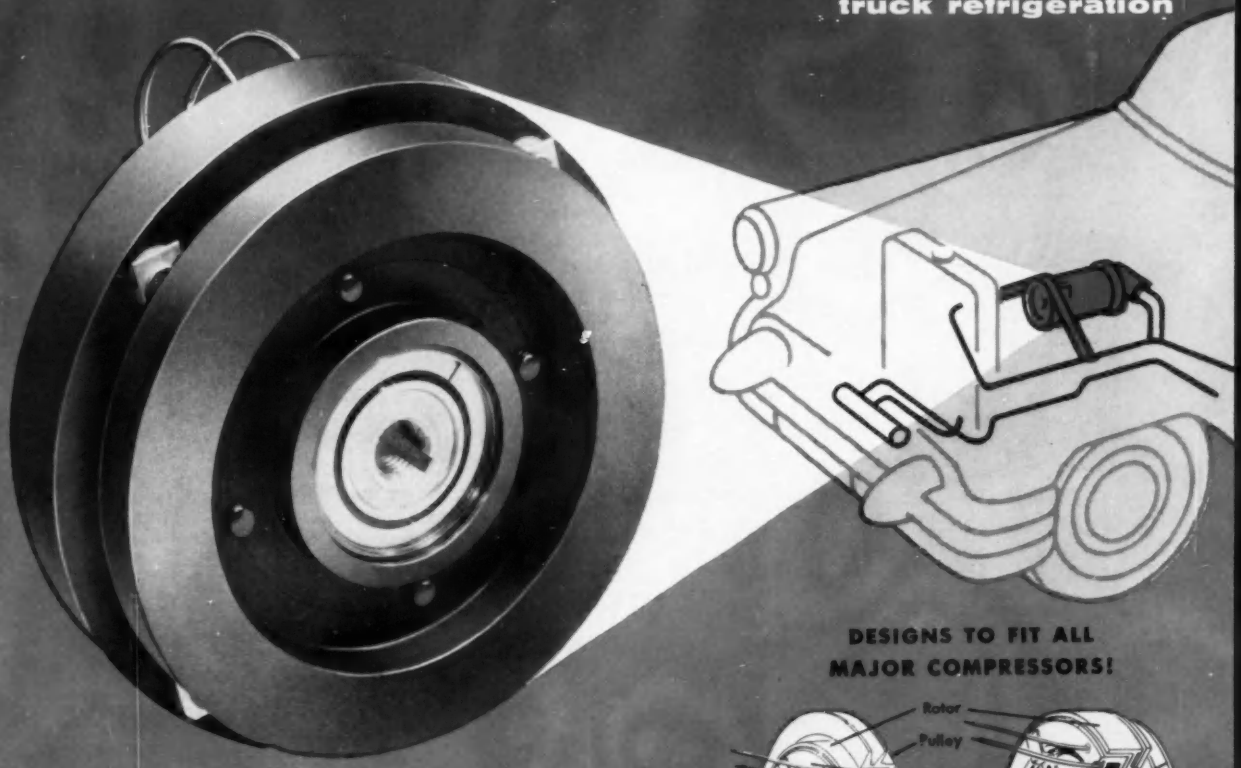
PROCESSING EQUIPMENT DIVISION
Crystallizers . . . Direct Fired Heaters . . . Evaporators . . . Heat Exchangers . . . Mixing and Blending Units . . . Quick Opening Doors . . . Special Carbon and Alloy Processing Vessels . . . Synthesis Converters

MACHINERY DIVISION
MACHINERY for Sheet and Structural Metal Forming . . . Tangent Benders . . . Folding Machines . . . Roller Table and Tumble Die Bending Machines . . . Press Brakes . . . Punching and Notching Machines . . . Forming Dies

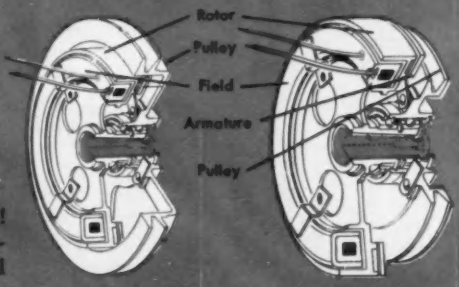
NEW WARNER ELECTRIC COMPRESSOR CLUTCH

that leading manufacturers have switched to

for selective operation of automotive air conditioning and truck refrigeration



DESIGNS TO FIT ALL MAJOR COMPRESSORS!



Only two simple assemblies. Stationary magnetic field mounts to compressor seal plate. Rotor-pulley assembly mounts to compressor shaft.

Operates off 6 to 12 volt battery. No slip rings or brushes. Standard pulleys to meet most design requirements.

Steps up engine performance and reduces costs

Here's the simplest and most efficient compressor clutch on the market! Reduces engine noise and power loss. Because of clutch disconnect, engine starts faster and easier in cold weather. Saves battery life and fuel costs. Economical and easy to install. Pays for itself, *fast.* No complex linkages—nothing to adjust or go wrong. Dependable and service-free for life—no brushes or collector rings. Magnetic principle, design-pioneered by Warner, simplifies use of toggle switch or pressure control. Offers all the standout quality and engineering advances your customers look for in fine motor cars and trucks. Now in production for many leading manufacturers and equipment builders.

WARNER®

Beat competition with

ELECTRIC BRAKES AND CLUTCHES

Warner Electric Brake & Clutch Co.
Beloit, Wisconsin, U.S.A.

Warner Electric Brake & Clutch Co.
Dept. AI, Beloit, Wisconsin

Write for new Warner "Technical Report" on Electric Clutches for automobile air conditioning and truck refrigeration.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

Classified Advertisements

FUEL INJECTION PATENTS. 2,522,890—2,708,880. Injection is coming. Propositions invited. Box 11, Automotive Industries, 5601 Chestnut St., Philadelphia 39, Pa.

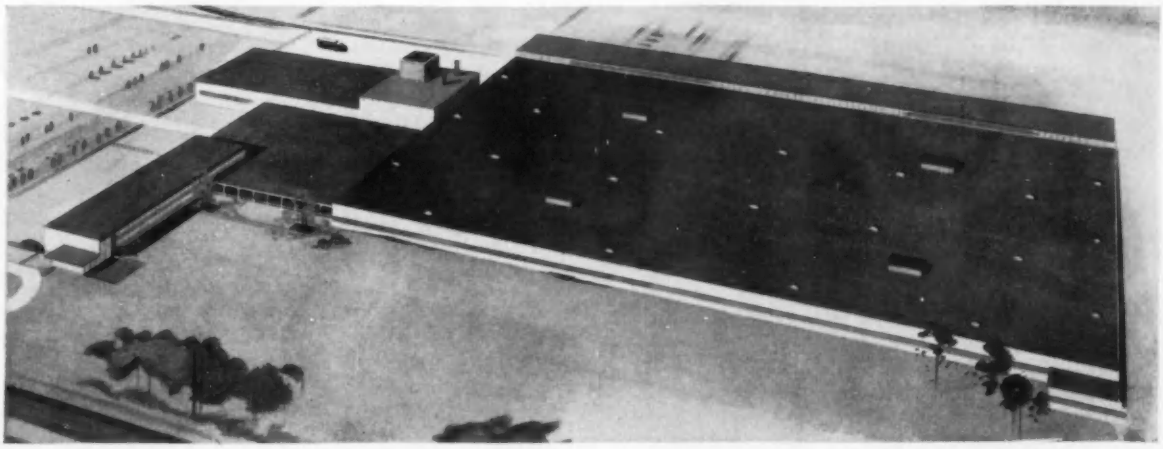
Wanted:—Government Surplus Automotive Spare Parts. Reply Box 10, Automotive Industries, 5601 Chestnut St., Philadelphia 39, Pa.

Index to Advertisers

This Advertisers' Index is published as a convenience, and not as part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert

Coming soon...

A new and modern automotive parts manufacturing facility



In a few months Thompson will begin operations in a new, modern parts manufacturing facility now nearing completion in the Detroit area. This new plant will employ the latest methods and equipment available to provide low cost, efficient manufacture of chassis parts.

Chassis design improvement has become an increasingly important factor in the automotive industry's future planning. This, plus the tremendous acceptance of Thompson steering linkage and other chassis parts has made Thompson's latest expansion necessary.

Finer steering linkage and suspension parts, new and advanced manufacturing techniques, better customer service—these are but some of the advantages Thompson will offer when its new Detroit plant begins operations.

Have *your* engineers call on Thompson to help develop your steering linkage and suspension. Write, wire or phone Thompson Products, Michigan Division, 7881 Conant Ave., Detroit 11, Michigan, WAlnut 1-5010.

You can count on Thompson Products

Michigan Division: Detroit • Fruitport • Portland

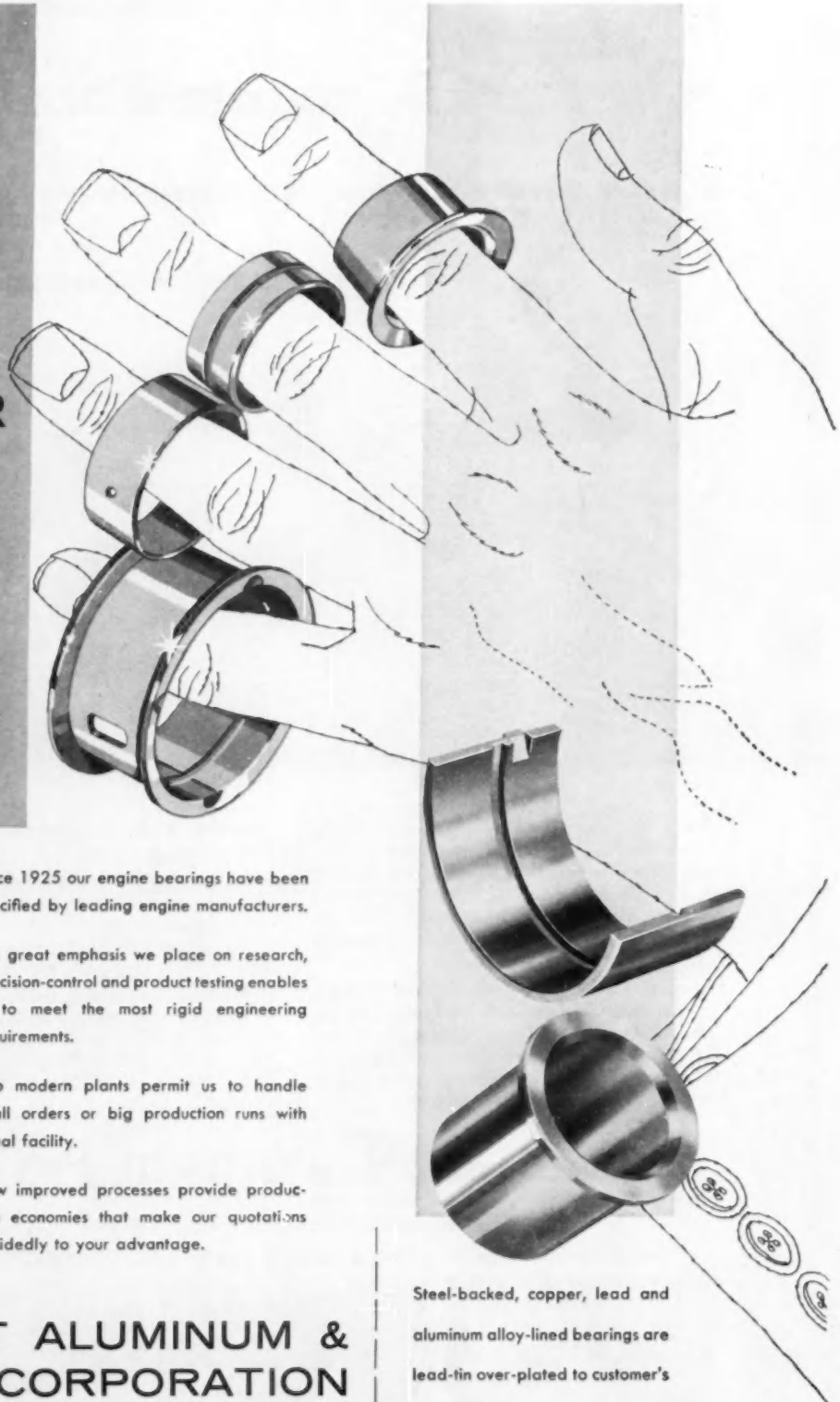
HOW THOMPSON STEERING-LINKAGE PARTS ARE "TORTURE-TESTED":

Double-Tested—week after week, 24 hours a day, extra-severe punishment is dealt out to Thompson's experimental and standard steering linkages, suspension ball joints, and other chassis parts.

In Addition—these parts undergo further tests in standard-model cars out on the open road . . . not only on average highways, but also on rutty, muddy and snowbound back roads.

Results?—These "torture tests", followed by skilled analyses by experienced Thompson engineers, result in the finest possible linkage and suspension systems for cars, buses, trucks, tractors.

4 THINGS TO REMEMBER THE NEXT TIME YOU BUY ENGINE BEARINGS



1. Since 1925 our engine bearings have been specified by leading engine manufacturers.
2. The great emphasis we place on research, precision-control and product testing enables us to meet the most rigid engineering requirements.
3. Two modern plants permit us to handle small orders or big production runs with equal facility.
4. New improved processes provide production economies that make our quotations decidedly to your advantage.

Steel-backed, copper, lead and aluminum alloy-lined bearings are lead-tin over-plated to customer's specifications.

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NEW

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NEW

ESPECIALLY DESIGNED FOR TOP RING GROOVE PROTECTION IN PISTONS FOR GASOLINE ENGINES

AN ECONOMICAL METHOD WITH MINIMUM WEIGHT INCREASE

CAN BE APPLIED TO ANY TYPE ALUMINUM ALLOY PISTON

PERMA-GROOVE*

WITH SEGMENTAL STEEL TOP RING SECTION

TOP RING SECTION

FRONT VIEW SECTION

CROSS SECTION

Again, Zollner engineering leadership provides another great piston development to engine builders. The new Zollner "Perma-Groove" gives sensationally longer life to pistons and rings, prevents blow-by, minimizes oil consumption. The light weight segmental steel section incorporates high wear resistance in the top ring groove *plus* the advantage of cool operation. Designed especially for gasoline engine pistons, "Perma-Groove" is the quality, low-weight and low-cost companion to the popular "Bond-O-Loc" piston for Diesel engines. We suggest an immediate test of "Perma-Groove" advantages for your gasoline engine.

*T. M. Reg. Pat. App. For

OUTSTANDING ADVANTAGES OF ZOLLNER "PERMA-GROOVE" TOP RING SECTION

1. Individual steel segments eliminate continuous band expansion problem.
2. Segments securely locked to prevent radial movement.
3. Dovetailed edges keep steel segments securely in plane with groove.
4. 75% steel bearing area for wear resistance.
5. 25% aluminum bearing area for heat conductivity and cool operation.
6. Light in weight.

ADVANCED ENGINEERING

PRECISION PRODUCTION

COOPERATION WITH ENGINE BUILDERS

ZOLLNER PISTONS

THE ORIGINAL EQUIPMENT PISTONS

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